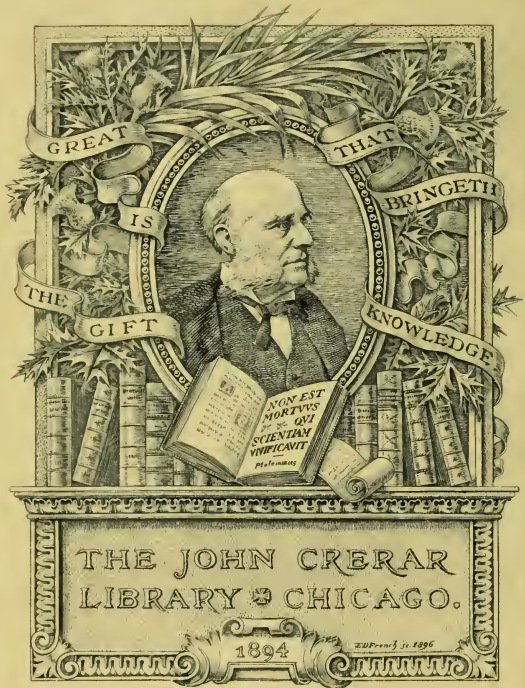

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Series I
Quarterly

No. 1
May, 1906

South Dakota State School of Mines

1906-1907

Rapid City, South Dakota

Annual Catalog

Application has been made to the Past Office Department for entry as second class mail matter

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The SOUTH DAKOTA State School of Mines

Annual Catalog

1906 A.C.M. 1907

THE
MANSFIELD

CIVIL CALENDAR

STATE NORMAL

1906

SEPTEMBER						
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1907

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Vacations and Holidays are indicated by the heavy-faced figures.

COLLEGE CALENDAR

School year begins.....Wednesday, September 19, 1906

Entrance Examinations begin.....September 17, 1906

Registration Committee considers applications for Advanced Standing and Credentials for Admission without examinations .....September 18, 1906

Thanksgiving Day Recess.....
.....November 29 to December 1, 1906, inclusive

Christmas Vacation .....
.....December 24, 1906, to January 5, 1907, inclusive

Examination Week .....
.....January 28 to February 1, 1907, inclusive

First Semester ends .....February 1, 1907

Second Semester begins .....February 4, 1907

Washington's Birthday Anniversary....February 22, 1907

Spring Recess.....April 8 to 13, 1907, inclusive

Memorial Day.....May 30, 1907

Examination Week.....May 27 to June 1. 1907, inclusive

Baccalaureate Sermon .....June 2, 1907

Granting of Diplomas in Preparatory Department .....June 3, 1907

Faculty and President's Reception.....June 4, 1907

Commencement and Conferring of Degrees..June 5, 1907

Second Semester ends .....June 5, 1907

378.783
Smith
284853

REGENTS OF EDUCATION

Members of the Board

Ivan W. Goodner, Pierre.....
.....Term expires January 1, 1907

R. M. Slocum, Herreid.....
.....Term expires January 1, 1907

A. W. Burtt, Huron.....
.....Term expires January 1, 1909

Frederick A. Spafford, Flandreau.....
.....Term expires January 1, 1909

M. F. Greeley, Gary.....
.....Term expires January 1, 1911

Officers of the Board

Ivan W. Goodner, President, Pierre.
Irwin D. Aldrich, Secretary, Big Stone.
C. B. Collins (State Treasurer),
Treasurer Ex-Officio.

Regents' Committee in Charge of the School of Mines

Ivan W. Goodner. A. W. Burtt.

FACULTY

CHARLES HERMAN FULTON, President and Professor of Metallurgy.

E. M. School of Mines, Columbia University.

CLEOPHAS CISNEY O'HARRA, Professor of Mineralogy and Geology.

A. B. Carthage College. Ph. D. Johns Hopkins University.

HOWARD LINCOLN MCLAURY, Professor of Mathematics.

A. B. Oberlin College. A. M. Harvard University.

MARK EHLE, JR., Professor of Mining.

E. M. Colorado School of Mines.

MELVILLE FULLER COOLBAUGH, Professor of Chemistry.

B. S. Colorado College. A. M. Columbia University.

JOHN MCLEARIE, Professor of English.

A. B. Macalester College. A. M. University of Chicago.

CLARENCE LESLIE LEWIS, Lecturer on Mining Law.

University of Michigan.

ADELBERT DALE HUMBERT, Instructor in Mathematics and Preparatory Science.

Cornell College.

STEIN BANGS, Instructor in Physics.

Purdue University.

NORMAN RALPH JEWETT, Instructor in Engineering.

B. S. and E. M. Michigan College of Mines.

ELBERT MARCUS STEVENS, Principal of Preparatory Department, and Instructor in Modern Languages.

A. B. University of South Dakota. A. M. Yale University.

MATILDA WOODS, Instructor in History.

A. B. Wellesley College.

DELLA MAY HAFT, Librarian and Registrar.

Ph. B. University of Chicago.

CLAUDE CORNELIUS VAN NUYS, Assistant in Chemistry.

B. S. Yankton College.

JOHN BURNS READ, Assistant in Assaying.

JESSE OATMAN BETTERTON, Assistant in Chemistry.

IVAN EDGAR GOODNER, Assistant in Mining and Metallurgy.

Other Employes

WILLIAM A. COURSEN, Chief Janitor and Engineer.

GEORGE A. HOWELL, Janitor.

HOMER CHARLES, JR., Fireman.

STANDING COMMITTEES OF THE FACULTY

Committee on Admission and Registration:

Professor McLaury
Professor Ehle
Mr. Humbert
Mr. Stevens
Mr. Bangs

Committee on Emergencies and Discipline:

Professor O'Harra
Professor McLearie
Professor Ehle
Professor McLaury

Committee on Course of Study:

Professor Ehle
Professor O'Harra
Mr. Stevens
Mr. Jewett

Committee on Catalog and Publications:

Mr. Humbert
Mr. Jewett
Professor Coolbaugh
Professor McLaury

Committee on Library:

Miss Haft
Mr. Stevens
Miss Woods

Committee on Athletics:

Professor McLearie
Professor O'Harra
Mr. Stevens

Committee on Student Organization:

Professor McLearie
Professor McLaury
Miss Woods
Professor Coolbaugh

The regular meeting of the faculty is held on the first Monday of the month.

GENERAL STATEMENT

ESTABLISHMENT OF THE SCHOOL, ETC

The School of Mines is a state educational institution, and is at present almost wholly maintained by appropriations of the State Legislature. It is endowed with 40,000 acres of land, lying in the State of South Dakota, and a grant from the federal government. It receives a comparatively small income from the rental of these lands, which are, however, steadily increasing in value. The school is under the control of the Regents of Education. The regents, five in number, are appointed by the governor, confirmed by the senate, and have control of the various public institutions of learning maintained wholly, or in part, by the State as State Institutions.

The following is an extract from the act of the legislature, establishing the School of Mines:

Section 1. (School of Mines Established.) That a School of Mines for the Territory of Dakota be established at Rapid City, in Pennington County, Dakota Territory. It shall be the object of such School of Mines to furnish facilities for the education of such persons as may desire special instruction in Chemistry, Metallurgy, Mineralogy, Geology, Mining, Milling, Engineering, Mathematics, Mechanics, Drawing, the Fundamental Laws of the United States, and the Rights and Duties of Citizens.

Approved March 7, 1885.

HISTORY AND AIM OF THE SCHOOL

The chief aim of the State School of Mines is to offer young men a thorough education in

mining and metallurgical engineering, believing that thereby the exploitation of the mineral resources of the State will be aided. Whenever it is possible, the School also aids the development of the mineral resources by the investigation of mining and metallurgical problems which arise in the district. At the present time, many graduates of the School are employed in responsible positions in the Black Hills and throughout the West generally, and are doing much toward the developing of the State's mineral wealth. It is well known that the successful exploitation of the Cambrian ores of the Black Hills was due in a large measure to the experiments performed at the State School of Mines. This refers particularly to the chlorination process and to sulphide smelting. The School issues, from time to time, bulletins treating of Black Hills economic geology, and of mining and metallurgical methods, which can be obtained by those interested, upon request.

The first building of the School was erected in 1885, and is a three-story brick structure in which were originally chemical and assay laboratories, and class rooms. The staff of instructors was necessarily small and the course by no means complete. The School, however, under able management, steadily though slowly gained in reputation, and, in 1887, erected a second building to serve the purpose of a metallurgical laboratory. This building is 138 by 60 feet in size, and was fitted with metallurgical and mining experimental machinery. In 1901 what is now the Main Building of the School was erected, the legislature appropriating $20,000 for that purpose. In 1903

another $20,000 was appropriated by the legislature for an addition to the Main Building, and $5,000 was appropriated for the construction of a separate heating plant. In 1905 $8,000 was appropriated for the improvement of the metallurgical laboratory and extension of the heating plant, etc.

The number of buildings and equipment, at the present time, is such as to give good facilities for thorough instruction in mining and metallurgy.

LOCATION

The School of Mines is located in Rapid City, in the foot hills of the Black Hills of South Dakota. Rapid City is on the Chicago & Northwestern Railway, on that branch extending from Omaha to Deadwood and Lead, South Dakota. Within the year, Rapid City will also have direct connection with the eastern part of the state. by means of a branch of the same railroad now under construction from Pierre to Rapid City; and also by the Chicago, Milwaukee & St. Paul Railway now under construction from Chamberlain, South Dakota, to Rapid City. It has also connection with the Burlington system by means of the Missouri River & Northwestern Railway from Rapid City to Mystic.

Rapid City is a growing town of about 2,500 inhabitants. It was founded in 1876 and is the most beautifully located town in the Black Hills. It is situated on Rapid Creek, and a half hour's walk takes one either out on the plains or into the hills. It has large stores of all kinds, and

living is comparatively cheap for a western town. It offers many advantages as a college and residence city. It has seven churches, representing practically all the principal denominations. There are costly water works fed by springs, four miles back in the hills; also a modern illuminating gas works and an electric lighting plant, furnishing the city with light.

The elevation of the city is 3,200 feet above sea level and the climate is a very healthful one, the winters being usually mild and the summers cool. The climate is dry, the average rainfall being about 20 inches.

There is much social life in the town, and students, after becoming acquainted, may enjoy the civilizing influence of home life. The students of the School find board and lodging in the homes, as the School does not maintain a dormitory.

The distance to Deadwood is only 46 miles and but a little more into the heart of the great producing mining section of the Hills. The mining districts of Keystone, etc., are within 25 miles of Rapid City. It was thought desirable to locate the School at some distance from the active mining region, rather than directly within it, for it is now realized in technical education that the teaching of the fundamental sciences must be thoroughly accomplished before their technical application can be considered. If the School were located directly within the bustle of the mines and mills, it is very probable that, to some extent, the extremely practical surround-

ings might interfere with the proper methods of study of the preliminaries.

In the last two years of the course, many visits are made to the active mining districts for the purpose of a close study of the methods in vogue. It is the intention, within the next year or so, to establish a summer school of mining to last six to eight weeks, in order to give the student a still more practical acquaintance with mining and metallurgical methods.

The location of the school is very favorable for the study of Geology. The Black Hills have long been known to afford remarkable facilities for the field study of Geology, in that the rocks of practically all ages are exposed in the uplift of the Black Hills. The great eruptive districts of the Northern Hills afford fine opportunities for this branch of Geologic study.

Close to the school, within a few hundred yards, is the pyritic smelting plant of the Standard Smelting Company, which treats the ores from the surrounding districts. It smelts ores, collecting the values into a matte which is shipped to other plants for refining. This plant affords the more advanced students in Metallurgy every facility for an intimate study of a very interesting process. The management of the plant extends every courtesy to the students of the School of Mines.

BUILDINGS AND EQUIPMENT

Buildings and Grounds

The buildings in which the work of the

School is carried on are three in number: First, the original School of Mines building, a commodious brick structure, three stories in height, situated in the west part of the grounds, and at the present time devoted entirely to the Preparatory Department, in which students, found deficient in studies for entrance into the School of Mines, are properly prepared. It contains a large assembly room and class rooms for the sudy of languages, mathematics, history, and a laboratory for biology. It is heated throughout by steam, furnished from the central power plant, and is lighted by electricity.

In the center of the grounds is the Main Building of the School, a large brick structure, with native sandstone trimmings, three stories in height, built in two wings in the shape of a T. This building contains in the front wing, on the first floor, a large entrance hall, a geological museum, class rooms in Mathematics and English, the President's and the Registrar's offices. On the second floor are chemical laboratories, comprising the general, qualitative and quantitative laboratories, and offices and class rooms of the Department of Chemistry. The basement of the building contains the physical laboratory, store rooms, lunch room, and the lighting plant. The first floor of the rear wing of the Main Building contains the Library and the balance of the Department of Geology and Mineralogy, consisting of class rooms and offices, and a thoroughly equipped mineralogical laboratory. The second floor contains the Department of Engineering, consisting of instructors' offices, two large draw-

ing rooms for the Freshmen and Sophomore classes respectively, a large lecture room, and a thoroughly equipped room for making blue prints. In the basement of this wing is a well equipped machine shop and store rooms. The machine shop serves the purpose of enabling the School to make a very appreciable amount of apparatus for scientific work as the occasion for its construction arises.

East of the Main Building is the Metallurgical Laboratory Building, 138 by 60 feet in plan, two stories in height, built of red brick with stone trimmings. This building is devoted exclusively to the Departments of Mining and Metallurgy. It contains, on the first floor, a large chemical laboratory for advanced metallurgical chemistry, a well equipped balance room, containing massive concrete piers for the mounting of balances, private chemical laboratory and supply room, assay laboratory and a large assay furnace room. In the rear of the assay furnace room is the metallurgical laboratory, containing mining and metallurgical machinery and apparatus.

On the second floor are located the lecture rooms of the Departments of Mining and of Metallurgy, offices of these departments, and a Mining and Metallurgical Museum.

On the east part of the school grounds is located the central heating plant, containing boilers, etc., which supply the three large buildings mentioned with heat, and the metallurgical laboratory with power. It is built of stone and has adjoining sheds with a large capacity for the storage of coal. Owing to the scarcity of water

until comparatively recently, the grounds of the School, comprising eleven acres, do not present as attractive an appearance as might be. Strong efforts are now being made to beautify the grounds.

Equipment

In general, the School is well equipped to carry on its work. It has that essential of modern scientific technical instruction, ample laboratory facilities in all required branches.

Library

The libraries of the South Dakota State School of Mines are made up of a general library and the departmental libraries in Metallurgy, Mining, Geology, Chemistry, Engineering, Physics, English, and History.

The general library and reading room occupies a large, well lighted and well equipped room on the first floor of the annex of the Main Building. Here are kept the reference books and others of a general nature, not bearing directly upon the work of any particular department.

Economics, History, Philosophy, Agriculture, and Literature are represented.

In this room is also placed a library of 400 volumes of a miscellaneous nature which the Rapid City Library Association loans the School.

On the reading tables are found the best journals on Mining, Metallurgy, Geology, Chemistry, and Engineering, as well as magazines of a more general interest.

The following journals are on file:

Mining and Scientific Press

Engineering and Mining Journal

Mines and Minerals

Mining Reporter

Mining Magazine

Bulletins, American Institute of Mining Engineers

Bulletins, Institution of Mining and Metallurgy

Journal, Chemical, Metallurgical and Mining Society of South Africa

Metallurgie

Berg and Huetten-mannische Zeitung

Economic Geology

Bulletins, Geological Society of America

Journal of Geology

Engineering Magazine

Journal, American Chemical Society

Journal of the Society of Chemical Industry

Engineering News, and others of a similar bearing

Leading Daily Papers

Exchanges received from student publications.

The reference works contain, among others,

complete or partial sets of bound volumes of the following publications:

Transactions American Institute of Mining Engineers

Transactions Institution of Mining and Metallurgy

Engineering and Mining Journal

Mining Reporter

Bulletins, Geological Society of America

Journal, Chemical, Metallurgical and Mining Society of South Africa

Journal of Geology

American Geologist

The Mineral Industry

Bulletins of U. S. G. Survey, and others.

The departmental libraries contain all of the chief books bearing directly upon the work of the respective departments. They are, for the most part, readily accessible to the student. The card system of cataloging is in use.

Drawing Rooms

In the Department of Engineering are two large drawing rooms—one for Freshman and Sophomore work, the other for Junior work.

The rooms are fitted with specially designed drawing desks, each desk containing lockers in which students take care of their supplies. The drawing rooms are well lighted by many windows. Adjoining the Freshman drawing room is a large room for the making of blue prints. It contains

the blue print machine, sliding on a frame in the window, with south exposure, so that sunlight is available for the greater part of the day. A large sink for the washing of prints is provided.

Chemical Laboratories

There are three chemical laboratories—one for general chemistry, one for qualitative analysis, and one for quantitative analysis. The last two laboratories are equipped with large individual desks with tile tops, each desk being supplied with gas from the city mains. Between each two desks, a sink with flowing water is placed. Each student receives a separate and complete set of reagent bottles and supplies. The laboratories are well lighted and provided with ample hoods to carry off the fumes. The quantitative laboratory is equipped with separate balance room in which are analytic balances of standard makes, among them Becker and Troemner balances.

Ample apparatus is on hand for all mineral, alloy and rock analyses, including combustion furnaces, apparatus for gas analysis, and facilities for electrolytic precipitations, using the rotating cathode.

Physical Laboratory

The physical laboratory is located in the basement of the annex of the Main Building, thus securing absolutely stable foundations for such apparatus and instruments as require it.

The laboratory is thoroughly equipped with the ordinary physical apparatus, such as balances;

Atwood machine; hydrometers; specific gravity apparatus; spectroscopes; apparatus for the measurement of light; calorimeters; electrical apparatus, such as the Wheatstone bridge, voltmeters, ammeters, galvanometers; engine indicators, etc.

For electrical experimentation, dynamo and motors are available.

Assay Laboratory

The assay laboratory is very modern in its appointments. It has, within the last year, been completely remodeled. It contains a room in which the students are provided with individual desks; pulp balances for the mixing of assay charges; a balance room provided with concrete foundation piers; the pulp room in which ore samples, etc., are crushed and sampled; and the furnace room in which furnace work is done exclusively. This furnace room contains five double muffle-furnaces, heated by soft coal. These furnaces were specially furnished by the Denver Fire-Clay Company, Denver, Colorado.

They are placed in openings in a heavy dividing wall, separating the machinery hall from the front part of the building. In this way the front of the furnaces with the muffle openings are in the furnace room, flush with the wall, while the firing and taking out of ashes is done on the other side of the wall, thus avoidng the dust and dirt where it is very undesirable. The furnace room is fire-proof. There is a melting furnace

using coke; also gasoline furnaces, made by Braun & Company, San Francisco.

The balance room is provided with Ainsworth, Eimer & Amend, and Thompson balances. In the pulp room, a water motor furnishes power for the small Gates sample crusher and a sample grinder. A Calkins automatic cupel machine is used for the making of cupels. A large number of ore samples are kept on hand. Ores from all parts of this country are provided in great variety. The nearness of a smelter and mills makes it comparatively easy to procure many types of furnace products such as mattes, flue dust, fume, and umpire samples for close checking work.

Metallurgical Laboratory

The metallurgical laboratory contains machinery and apparatus, mainly illustrative of that used in the metallurgy of lead and copper, gold and silver. There is a 30-inch water-jacketed furnace, a small Bruckner roasting furnace, a Baker blower, a Dodge crusher, two sets of rolls, a dry crushing stamp battery, a wet crushing stamp battery equipped with automatic feeds, amalgamated copper tables, a Frue vanner table, two amalgamating pans for silver ores, one settling pan, sizing screens, hydraulic classifiers, jigs, and a cyanide leaching plant. Part of this machinery is at present not in use, as it will be re-set and added to within a short time. Most of it is used frequently in the work of the laboratory. Steam is furnished by the central power plant for the 40 horse-power Corliss mill engine.

Scientific metallurgical apparatus, consisting

of metallographic microscopes, pyrometers, electric resistance furnace, apparatus for gas analysis, etc., are available for frequent use. This portion of the equipment is rapidly being added to. A special chemical laboratory is provided in the Metallurgical Building, devoted to metallurgic analysis and research. Students carrying on thesis work in metallurgy have desks in this laboratory.

Mineralogical Laboratory

This is a large room well equipped with low tables arranged for the study and determination of minerals. Students are provided with the necessary reagents and apparatus by the department, upon the payment of a small fee. Each student has his own locker. A large working collection of carefully labeled minerals available for student use is kept in specially designed cases ready of access, and a considerable collection of unknown minerals is at hand for determination.

Geological Museum

The museum is an important feature in the equipment of the School of Mines. Its contents have been chosen to assist in the teaching of geology, mineralogy, petrography, and paleontology, rather than to become a store house of curiosities. The room is thirty-six by forty-seven feet in size and lighted by ten large windows.

Two kinds of cases are used for the display of specimens—central cases and wall cases. There are eight central cases, each consisting of two

parts of three compartments each, with glazed tops, and a six compartment massive base; the whole constructed in such manner as to serve practically as two sections, fitting tightly, back to back. The display surface, under glass, is nearly fifty feet square for each case. The bases are especially designed for the storage of material not needed for constant exhibition. The cases are all of oak.

The wall cases are finished in pine and have glazed doors. Each is seven feet six inches high and contains three double-doored compartments of six shelves. The cases are particularly adapted for the display of large specimens.

Cases one, two, and three, contain a general collection of minerals, arranged according to Dana's system of classification. Case four contains a series of specimens to illustrate various features of phenomenal geology. Case five contains a collection of well preserved fossils carefully selected to show the more prominent features of paleontological interest. Case six and case seven are reserved for Cretaceous and Tertiary fossils from the Black Hills region, mainly from the Bad Lands, and the Cheyenne river.

The wall cases are for large specimens of all classes, some of which are very beautiful. The collection from the Black Hills is especially noteworthy and is very rich in the rare minerals of the region, as for instance, lepidolite, wolframite, columbite, amblygonite, etc.

The museum contains two large topographic maps of the Black Hills made for the St. Louis

Exposition and kindly loaned for the present, by Mr. E. E. Howell, through the kindness of Mr. S. W. Russell.

The museum has also recently been enriched by the gift of a very valuable and unique rock section of the Homestake Mine, donated by the Homestake Mining Company of Lead, South Dakota.

The collection of minerals exhibited by the School at the St. Louis Exposition, 1904, received a diploma and gold medal.

Mining and Metallurgical Museum

This is, as yet, in its infancy. It is situated on the second floor of the Metallurgical Building, in a large, well lighted room and contains wall cases for the display of specimens. It has a fair collection of furnace products, such as slags, mattes, etc., wall boards of hoisting ropes and screens, and similar material. In time it will become a valuable adjunct to the teaching of mining and metallurgical subjects. It is constantly being added to by the kindness of the manufacturers and mining companies, who donate exhibits. The School is always very grateful for donations of this kind and makes due acknowledgment for the same.

Shops

In the basement of the Main Building a large workshop is provided, containing a machine lathe, planers, drill press, other machinery, and many tools. Occasion often arises for

the design and construction of certain pieces of apparatus for the different departments, especially those of Metallurgy and Mining, Physics, and Chemistry.

Many pieces of apparatus have been constructed in this shop which would have cost the School considerable sums of money. The students of the upper classes are granted permission to use the facilities offered by the shop, whenever occasion arises to do so, in their work.

PUBLICATIONS

Bulletin No. 1.—Preliminary Report of the Dako- School of Mines upon the Geology, Mineral Resources and Mills of the Black Hills of Dakota; 171 pages. 1888. (Out of print.)

By F. R. Carpenter and H. O. Hofman.

Bulletin No. 2.—Notes on the Geology and Mineral Deposits of a Portion of the Southern Black Hills; 41 pages; Department of Geology. 1899.

By C. C. O'Harra and A. Forsyth.

Bulletin No. 3.—Cyanide Experiments on the Siliceous Ores of the Northern Black Hills, etc.; 27 pages; Department of Metallurgy. 1900.

By A. Forsyth and G. H. Clevenger.

Bulletin No. 4.—History of the Early Explorations, etc., in the Black Hills, and Bibliography of Contributions to the Geology of the Black Hills Region; 88 pages; Department of Geology. 1900.

By C. C. O'Harra.

Bulletin No. 5.—The Cyanide Process in the Black Hills of South Dakota; 88 pages; Department of Metallurgy. 1902.

By C. H. Fulton.

Bulletin No. 6.—The Mineral Wealth of the Black Hills; 88 pages; Department of Geology. 1902.

By C. C. O'Harra.

Bulletin No. 7.—Metallurgical Practice in the Black Hills of South Dakota; 63 pages; Department of Metallurgy. 1904.

By C. H. Fulton.

No. 8.—Annual Catalog: Descriptive of the Courses given by the School, and containing general information.

No. 9.—Announcements containing information about the School, issued regularly.

No. 10.—The Aurum, published monthly, nine times per year, by the Students' Association of the State School of Mines. Subscription $1.00 per year. The Aurum contains besides school news technical articles of interest and value.

The Publications of the School may be had, free of charge, by addressing the President.

STUDENTS' EXPENSES

Tuition

The tuition and incidental fee is $6 per semester or $12 per year, payable in advance on

registration. This fee is the same to residents and to non-residents of the state.

According to Section 209 of the Political Code, 1903, Page 40:

"The regents shall fix all rates of tuition and other fees, to be paid by students, but such rates shall be the same in all the different institutions. They may receive, in any one of the institutions under their control, free of tuition, two students, appointed by each State senator, and one by each representative of the state legislature, which appointees shall be residents of their respective districts or counties, and whose term shall expire with the term of office of said senator or representative; provided that such appointees shall comply with all the rules and requirements of the institution which they desire to enter. No student, however, shall receive any other gratuity whatever."

Fees

Fees enumerated below cover the bare cost of materials and supplies consumed in the laboratories and loss due to breakage, etc.

All fees are payable at the beginning of each semester, on registration. (Consult Departments of Instruction for description of courses.)

Chemistry 1, Elementary Chemistry	$4 per semester
Chemistry 6, Qualitative Analysis	7 per semester
Chemistry 7, Quantitative "	8 per semester
Chemistry 8, Metallurgical "	8 per semester

Metallurgy 6, Assaying.....25

Metallurgy 7, Metallurgical Laboratory ..... 5 per semester

Metallurgy 8, Metallurgical Laboratory ..... 5 per semester

Mineralogy 1, General Mineralogy 5 per semester

Mineralogy 2, Blow-pipe Analysis 5 per semester

Geology 3, Petrography..... 2 per semester

Physics 2, Elementary Physics... 1 per semester

Physics 4, Advanced Physics..... 2 per semester

Engineering 7, Surveying..... 3 per semester

Engineering 3, Mechanical Drawing ..... 1 per year

Engineering 5, Mechanical Drawing ..... 1 per year

Preparatory Science, Biology..... 2 per semester

Chemistry 1, 6, 7, and 8, deposit to cover breakage, etc..... 5

Metallurgy 6, deposit to cover breakage 3

Fee for advanced degree.....10

Other Expenses of the Nature of Fees

The Department of Engineering furnishes supplies for the mechanical drawing courses, practically at cost.

Engineering 1, Mechanical Drawing, will cost approximately, $7 for the year, exclusive of drawing instruments, which the student pur-

chases on his own account, prices ranging from $13 up for a good set of instruments.

Engineering 3, Mechanical Drawing, will cost approximately, $4 for the year.

Engineering 5, Mechanical Drawing, will cost $2.50 for the year.

Living Expenses

Board and room may be obtained in town with private families or in boarding houses or hotels, at rates varying from $20 to $30 per month, according to accommodation; $25 per month is a fair average and will insure good board and room. Rooms only may be obtained for from $5 to $10 per month, and table board for from $4 upward, per week. This makes the expense for board and room for the school year of 37 weeks range from $185 to $275, according to location and accommodation.

Expenses for laundry and incidentals vary with the individual. The average for laundry expense is about $20 for the school year.

Cost of Text Books

Freshman year	$13.00
Sophomore year	17.00
Junior year	23.00
Senior year	19.00

Incidental Expenses

Students are required, at various times, to take part in the geological, mining, and metallurgical trips undertaken into the Black Hills mining

district. The geological trip of the Freshman year usually costs the student about $10. Trips in the Junior and the Senior year, for mining and metallurgical exploration, cost a similar sum; so that the student should figure on a cost of from $30 to $40 at least, for expenses of this kind during his four years' course at the School.

Total cost, including living, fees, books, incidental expenses, etc.:

Freshman year	$280 to $380
Sophomore year	275 to 370
Junior year	320 to 430
Senior year	290 to 385

This estimate does not include expenses incurred outside of school. A certain sum for this purpose should be added according to individual taste.

Opportunity For Self Help

Opportunity for self help in a town of the size of Rapid City is necessarily limited. It is also to be borne in mind that the course of study is an arduous one and requires the student's best effort, and if conscientiously and satisfactorily performed, will leave comparatively little outside time in which to earn funds.

Some students find employment which nets them their board and lodging by doing chores in private families or assisting in some of the stores. Some find employment in the boarding houses. The School is able to assist Junior and Senior students, to some extent, by employing them in the capacity of assistant janitors and similar work.

Students who have become acquainted, by a residence in town for a year or two, find it easier to obtain help than strangers. For this reason it is essential that a student who comes as a stranger to enter the School, should be provided with sufficient funds to carry him through the first year, at the very least.

STUDENT ORGANIZATIONS AND ATHLETICS

The student organizations are, The Students' Association, and The Athletic Association. The Students' Association has for its aim the general welfare of the student body and also publishes the official student organ, "The Aurum." The Athletic Association has for its aim the furtherance of legitimate athletics, and has maintained football and baseball teams and track athletics. The School encourages athletics within reasonable limits, in so far as they do not interfere with the work of the School.

CONDUCT

The School has no codified rules of conduct. Students are held to a strict account of their work and are expected to fulfill their inheritance as gentlemen. Failure to live up to these requirements is considered a sufficient cause for severing their connection with the School.

DETERMINATIONS OF MINERALS AND ASSAYING

Minerals are determined free of charge. Samples for determination should be addressed to the Department of Geology, State School of Mines, Rapid City. Assays for gold and silver, etc., and

chemical analyses, both quantitative and qualitative, are made at a reasonable rate. Prices will be sent upon application to the Department of Metallurgy. All samples for analysis and assay should be addressed to this department.

REQUIREMENTS FOR ADMISSION

Freshman Class

Requirements for admission to the Freshman class of the Mining Engineering couse are as follows:

Fourteen units are necessary for entrance.

Required Units

Arithmetic	1 unit
Algebra	1.5 units
Plane Geometry	1 unit
Solid Geometry	0.5 unit
English	2 units
History	1 unit
Physics	1 unit
Chemistry	1 unit
Total required units	9

Elective Units

German	1, 2, or 3 units
French	1, 2, or 3 units
Latin	2, 3, or 4 units
Greek	1 unit
Spanish	1 or 2 units
English	1 or 2 units
History	1 or 2 units
Mathematics	0.5 unit

Science	1 or 2 units
Drawing	1 unit
Shop Work	1 unit
Civil Government	0.5 unit
Bookkeeping	1 unit

Elective units required for entrance, 5.

A unit course of study is defined as a course covering a school year of not less than 35 weeks with 5 periods of at least 45 minutes each per week.

Method of Entering the School

First: By certificate. Graduates of accredited high schools in the State of South Dakota and other states will be provisionally admitted without examination, if they present proper credentials, specifying to the fact that they have completed the studies mentioned under the requirements for admission.

Second: By examination. All other candidates for admission to the regular mining engineering course will be required to pass entrance examinations in the subjects specified. These examinations are held at Rapid City, on dates mentioned in the calendar. Students who are deficient in subjects required for entrance into the regular mining engineering course are permitted to enter the Preparatory Department, maintained by the school for the special purpose of preparing students so deficient.

Credentials for entrance should be in the hands of the President on or before the date

set in the calendar for the examination of credentials by the committee on admission.

Description of Units Required for Entrance

Required Units

Mathematics—The four and one-half units which may be offered in mathematics are as follows:

Arithmetic—One unit, complete, including the metric system.

Algebra—One and one-half units. The equivalent of A, B, and C algebra described under the Department of Mathematics for preparatory students.

Plane Geometery—One unit. The equivalent of plane geometry described under the Department of Mathematics for preparatory students.

Solid Geometry—One-half unit. The equivalent of solid geometry described under the Department of Mathematics for preparatory students.

English—Two units. The equivalent of English 1 and 2 described under the Department of English for preparatory students, and other courses described in that department.

Physics—One unit. The equivalent of physics described under the Department of Physics for preparatory students.

Chemistry—One unit. The equivalent of elementary chemistry described under the Department of Chemistry.

History—One unit. The History of the

United States, English or Ancient History, as described under the Department of History.

Elective Units

The equivalent of courses, not mentioned above, described under the Departments of Mathematics (trigonometry only), Departments of Languages, History, English, and Preparatory Science.

Special Students

Applicants for admission, who are graduates of colleges or technical schools will be admitted as special students and permitted to take any subject they desire, taught in connection with the regular courses. Persons of mature age, who have been employed in mines and metallurgical plants and who desire to take up special courses, particularly along the lines of mining, metallurgy, and geology, will be admitted as special students, provided they show that they have sufficient foundation to take up the work with profit to themselves. No immature persons will be permitted to enter the School to take advanced courses, such as Assaying, Metallurgy, etc.

Admission to Advanced Standing

Graduates of colleges and technical schools who enter the School as candidates for a degree will receive proper credit for all such studies which they have completed and which form part of the curriculum of the School of Mines. The faculty decides these cases upon the basis of individual merit.

DEGREES

The School of Mines offers two degrees: That of Bachelor of Science in Mining Engineering, to the candidate who has successfully completed the regular Mining Engineering course; and that of Bachelor of Science in Metallurgical Engineering, to the candidate who completes successfully the metallurgical option of the Mining Engineering course.

The degree of Engineer of Mines or Metallurgical Engineer, will be conferred upon graduates of the Engineering course of the School, who shall have devoted one year to graduate study in the School of Mines, under the direction of the faculty, passing required examinations upon the studies pursued or to those who shall furnish suitable evidence of two years' successful experience in mining or metallurgical work.

Students who complete the studies in the Preparatory Department will receive, therefor, the usual diploma.

THESIS

Every candidate for a degree in the regular Mining Engineering course or in the Metallurgical option of that course is required to present a thesis on some mining, metallurgical, or geological subject before he will receive his degree. The candidate for a degree should make a choice of subject and submit it to the faculty for approval not later than October first of the senior year. If no choice is made by that time the faculty will assign a subject. After the choice of the thesis, the candidate for the degree should confer con-

cerning it with the professor in charge of the department within which it naturally falls.

Theses must be submitted to the faculty not later than May 15, and must be typewritten on paper 8.5 by 11 inches in size. Two copies must be furnished; one for the department within which the thesis falls and one for the library. No degrees will be granted unless the conditions concerning theses are fully satisfied.

COURSES AND DEPARTMENTS

The courses given by the School of Mines are:

First—Mining Engineering Course..... 4 years
Second—Mining Engineering Course, Metallurgical Option ..... 4 years
Third—Scientific Preparatory Course..... 3 years
Fourth—College Preparatory Course..... 4 years

SYNOPSES OF COURSES

Mining Engineering Course

Freshman Year

	Lecture Periods,	Laboratory Hours
FIRST SEMESTER—		
Mathematics 7, Trigonometry.....	5	
Chemistry 2, General Chemistry.....	3	
Chemistry 3, 6, Qualitative Analysis..	2	9
Geology 1, General Geology.....	4	3
Engineering 1, Mechanical Drawing..		6
English 5, Composition 5.....	3	
SECOND SEMESTER—		
Mathematics 8, Analytic Geometry...	5	
Chemistry 2, General Chemistry.....	3	
Chemistry 3, 6, Qualitative Analysis..	2	9

	Lecture Periods.	Laboratory Hours
Geology 1, General Geology	4	3
Engineering 1, Mechanical Drawing		6
English 5, Composition 5	3	

Sophomore Year

FIRST SEMESTER—

Mathematics 9, Calculus	5	
Physics 3, 4, Advanced Physics	2	3
Chemistry 4, 7, Quantitative Analysis	2	9
Mineralogy 1, General Mineralogy	3	3
Engineering 3, Mechanical Drawing		6
Engineering 2, Descriptive Geometry	1	
English 6, Composition 6	2	

SECOND SEMESTER—

Mathematics 10, Calculus	5	
Physics 3, 4, Advanced Physics	2	3
Chemistry 4, 7, Quantitative Analysis	2	9
Mineralogy 2, Blowpipe Analysis	1	6
Engineering 4, Mechanism	2	
Engineering 2, Descriptive Geometry	1	
Engineering 3, Mechanical Drawing		6

Junior Year

FIRST SEMESTER—

Engineering 7, Surveying	3	9
Geology 2, Physical Geology, or Chemistry 5, 8	3	3
Mathematics 11, Mechanics	5	
Mining 1, Boring, etc.	3	
Mining 8, Ore Dressing	3	
Engineering 6, Graphics	1	3
Engineering 5, Mechanical Drawing		6

SECOND SEMESTER—

	Lecture Periods.	Laboratory Hours.
Engineering 7, Surveying	2	9
Geology 3, Petrography, or Chemistry 5, 8	3	3
Mathematics 12, Applied Mechanics	5	
Mining 2, Tunneling, Shaft Sinking	3	
Metallurgy 1, General Metallurgy	3	
Metallurgy 6, Assaying	2	9

Senior Year

FIRST SEMESTER—

Mining 3, Hoisting, Transportation, etc.	5	
Metallurgy 2, 3, 7, Iron and Steel, Copper and Lead	5	6
Geology 4, Economic Geology, or Metallurgy 5, 8	4	
Engineering 8, 9, Hydraulics and Thermo-Dynamics	4	
Mining 6, Design of Mine Plant		6
Mining 5, Mine Accounting		3
Thesis		3

SECOND SEMESTER—

Mining 4, Drainage, Ventilation, etc.	5	
Metallurgy 4, 7, Metallurgy of Gold and silver	5	3
Geology 4, Economic Geology, or Metallurgy 5, 8	4	
Engineering 8, 10, Hydraulics, Power Plant	4	3
Mining 6, Design of Mine Plant		6
Mining 7, Mining Law	1	
Thesis		6

Note: Fifty minutes constitute a lecture period, and sixty minutes a laboratory hour.

Scientific Preparatory Course

First Year

	Lecture Periods	Laboratory Hours.
FIRST SEMESTER—		
Mathematics 1, Algebra A	5	
English 1, Composition 1	5	
History 2, Ancient History	5	
Preparatory Science 3, Bookkeeping	1	9
SECOND SEMESTER—		
Mathematics 1, Algebra A	5	
English 1, Composition 1	5	
History 2, Ancient History	5	
Preparatory Science 3, Bookkeeping	1	9

Second Year

FIRST SEMESTER—		
Mathematics 3, Plane Geometry	5	
English 2, Rhetoric and Composition	5	
German 1, Elementary German	5	
Preparatory Science 2, Biology	3	6
SECOND SEMESTER—		
Mathematics 4, Plane Geometry	5	
English 2, Rhetoric and Composition 2	5	
German 1, Elementary German	5	
Preparatory Science 3, Physical Geography	3	3

Third Year

FIRST SEMESTER—		
Mathematics 5, Solid Geometry	5	
Physics 1, 2, Elementary Physics	3	6
German 2	4	

	Lecture periods	Laboratory hours.
Chemistry 1, Elementary Chemistry..	3	6
SECOND SEMESTER—		
Mathematics 2, Algebra B.....	5	
Physics 1, 2, Elementary Physics....	3	6
German 2	4	
Chemistry 1, Elementary Chemistry..	3	6

College Preparatory Course

First Year

FIRST SEMESTER—

Arithmetic	5
Latin 1, Beginning Latin.....	5
English 1, Composition 1.....	5
History 1, English History.....	3

SECOND SEMESTER—

Arithmetic	5
Latin 1, Beginning Latin.....	5
English 1, Composition 1.....	5
History 1, English History.....	3

Second Year

FIRST SEMESTER—

Mathematics 1, Algebra A.....	5
Latin 2, Caesar and Latin Composition	5
English 2, Rhetoric and Composition 2	5
History 2, Ancient History.....	5

SECOND SEMESTER—

Mathematics 1, Algebra A.....	5
Latin 2, Caesar and Latin Composition	5
English 2, Rhetoric and Composition 2	5

History 2, Ancient History..... 5

Third Year

FIRST SEMESTER—

Mathematics 3, Plane Geometry..... 5
Latin 3, Cicero and Latin Composition 5
English 3, English Literature and Composition 3..... 5
German 1, Elementary German..... 5

SECOND SEMESTER—

Mathematics 4, Plane Geometry..... 5
Latin 3, Cicero and Latin Composition 5
English 3, English Literature and Composition 3..... 5
German 1, Elementary German..... 5

Fourth Year

FIRST SEMESTER—

Mathematics 5, Solid Geometry..... 5
or
English 4, American Literature..... 4
Latin 4, Vergil and Latin Composition 5
German 2 4
Physics 1, 2, Elementary Physics.... 3 6

SECOND SEMESTER—

Mathematics 5, Solid Geometry..... 5
or
English 4, American Literature..... 4
Latin 4, Vergil and Latin Composition 5
German 2 4
Physics 1, 2, Elementary Physics.... 3 6

DEPARTMENTS OF INSTRUCTION

Department of Mining

PROFESSOR EHLE.

The instruction in Mining is given by lecture courses, illustrated by lantern views, photographs and drawings; by frequent references to standard works and current literature; by experimental work on various types of ores, carried on in the mining laboratory, and by excursions to near-by mines and mills for the purpose of observing and noting actual conditions of practice.

The department enjoys, to an unusual degree, those advantages which naturally accrue from the School's location. Being contiguous to a world famous mining region, the nearness of large producing mines means much, while the wholesome mining atmosphere in which the student lives, furnishes a never failing supply of food for enthusiasm and interest.

The mining and metallurgical laboratory of the School, which has proven a most valuable adjunct to the work of instruction, is soon to be completely overhauled and re-equipped with modern appliances of approved design. The various operations attendant upon the preliminary treatment of various types of ore will here be carried out by the students, on a scale approaching commercial practice.

It is the intention of the department to inaugurate, during the early part of the summer vacation of 1907, a Summer School of Mining, which shall hence-forward constitute a regular

annual feature of the work, and attendance upon which shall be obligatory with all regular members of the Junior class. A suitable mining locality having been decided upon, the students, under the direction of instructors, will spend from two to three weeks in the careful study of practical mining, both above and below ground; careful and systematic note taking and sketching of all the principal features being a requirement.

The uniform courtesy and good will shown by the managements of mining enterprises throughout the region, to instructors and students, indicates a wholesome regard for the efforts of the department and constitutes one of its most valuable assets.

The following courses of study are offered by the department:

Mining 1

Borings: The use of the earth auger, drive pipe, etc., in the boring of holes for wells and for prospecting purposes; the boring of deep holes by the churn drill or drop tool; also by the diamond and other rotary drills; the survey of bore holes; the cost of boring.

Breaking ground: The excavation of earth and rock in general; hand tools; mechanical earth excavators; rock drills and drilling; channelers; coal cutters; steam shovels; dredges, etc.; estimates and costs of excavation.

Explosives: Black powder, nitro-glycerine, gun cotton, and their derivatives; methods of testing, and calculation of heat and pressure de-

veloped; pointing and charging of holes; methods of firing; costs of blasting operations.

Junior Year, First semester: Three lecture periods per week.

Mining 2

Tunneling: The driving of mine tunnels and drifts through rock and through soft or running ground; comparative costs; general discussion of the methods used in driving large tunnels for railroad or other purposes.

Shaft Sinking: The sinking of shafts for mining purposes through soil, rock, quicksand and other water bearing strata, by approved methods; costs of same.

Supporting Excavations: The use of wood, metal and masonry in the lining of shafts and other excavations; their relative cost, strength and durability; the timbering of stopes, stations and other working places underground; the preservation of timber.

Junior Year, Second semester: Three lecture periods per week.

Mining 3

Exploitation: The extraction of mineral by open works; by wells and bore holes; the underground working of veins, bedded deposits, and masses, by methods best suited to each; conditions affecting the choice of methods; costs of ore extraction.

Transportation: Underground and surface; vehicles and motive powers; self acting and

engine planes; haulage by the tail rope and by the endless rope systems; electric and compressed air haulage; surface tramways and aerial ropeways.

Hoisting: Hoisting engines, their construction and chief features; methods of equalizing the load moment on the engine; ropes, cages, skips, and safety appliances; gallows frames; pneumatic hoisting; costs.

Senior Year, First semester: Five lecture periods per week.

Mining 4

Drainage: Sources of mine water; dams and drainage levels; hoisting of water; direct acting and Cornish pumps; use of compressed air and electricity in pumping operations; special devices; examples and costs.

Ventilation and Lighting: Natural and induced ventilation; furnaces and fans; friction of air in mines; control of air currents; efficiency of ventilating apparatus; the use of candles, open lights, safety lamps and the electric light in underground illumination.

Hygienic Conditions: Surface arrangements for the comfort and convenience of the miner; ascent and descent by ladders, cage or man engine, and relative economy of different methods; accidents, their causes and prevention; rescue and relief of men; mine fires.

Administration: Business management and the principles of employment of labor; organization of mine staff.

Mine Examination: Sampling of ore bodies; estimation of "ore in sight," and the valuation of mining properties; forms of report.

Placer Mining: Sluices, riffles, pipe lines, nozzles and hydraulic elevators, their construction and use; river dredging; costs and results.

Senior Year, Second semester: Five lecture periods per week.

Mining 5

MR. HUMBERT.

Mine Accounting: Organization of corporations and stock companies, with particular reference to mining and metallurgical companies; discussion of systems of mine and mill accounting, keeping account with the different departments; derivation of cost sheets, etc.; accounts of smelting and milling plants, yard books, furnace records, ore books, smelting records, etc. General methods of business; buying and selling ores; labor, etc.; organization of the staff of a mining and metallurgical company.

Senior Year, Second semester: Three laboratory hours per week.

Mining 6

Design of Mine Plant: The student is given certain data, relative to a hypothetical mine, such as maximum depth of hoist, capacity, speed of hoisting, etc., from which he calculates the power needed, selects the type and size of hoisting engines, makes calculations as to the size of reel for flat rope, and drums of different forms, such as to give the best results in the equalization of

moment on the engine. He then calculates and designs the gallows frame and shaft house, also such features as ore bins, mine car, cage or skip, etc.

Senior Year, six laboratory hours per week throughout the year.

Mining 7

MR. C. L. LEWIS.

Mining Law: During the year Judge C. L. Lewis will deliver a series of lectures before the members of the Senior class, in which he will discuss and exhaustively review the general mining laws with reference to the public lands, embracing, among others, the following topics: The early history of mining prior to the enactment of the General Mining Law of Congress; the General Mining Laws of the United States and Territories; Mining Districts, their origin, how organized, and the customs, rules and regulations of miners; lands subject to location and who can locate; the proper location of lode claims; the proper location of placer claims; patent proceedings; timber and stone lands in the mining states, and special laws applicable thereto.

Senior Year, Second semester: One lecture period per week, fifteen weeks.

Mining 8

Ore Dressing: The principles of ore crushing, description of the various types of crushing machinery; screens and the principles of screen sizing; the theory and practical application of the dressing of ores by water currents, including descriptions of the principal forms of classifiers;

jigs and the laws of jigging; slime treatment, and the machinery for its accomplishment; general discussion of the Continental and English systems of ore dressing, and their American modifications; magnetic concentration; concentration by oil; dry concentration; the description and study of typical ore dressing mills.

Junior Year, First semester: Three lecture periods per week.

Department of Metallurgy

PROFESSOR FULTON. MR. READ.
MR. GOODNER.

Metallurgical subjects are taught by lecture courses with frequent reference to standard works on the subject, and to the current literature.

This work is supplemented, as far as possible, by laboratory testing and experiments and excursions to neighboring metallurgical works. The School is very favorably situated, contiguous to an active gold mining district, the Black Hills, affording an unparalleled opportunity to study the practical side of metallurgy, particularly that of gold, on a large scale and at close range.

The stamp mills, cyanide plants and smelter of Lawrence county are situated only 46 miles distant, reached easily by rail within a few hours time, while close to the School is the pyrite smelting plant of the Standard Smelting Company to which students have access for the purposes of study.

A well equipped metallurgical laboratory is available for use, for it is desirable that the

student should be thoroughly trained in the basic scientific principles of metallurgy. With actual metallurgic operations, on a large scale, the student becomes familiar to such an extent as is desirable during his school years, by the frequent visits to the working plants of the district.

In the laboratory, he becomes thoroughly acquainted with the use of pyrometers, calorimeters, microscopes for the examination of metals and furnace products; close and scientific experiments with the refining and heat treatment of steel, electric deposition of metals, formation of slags, refining of metals, cyanide process and amalgamation, etc., as well as to some extent with the actual working of a furnace, stamp mill, concentrating tables, with which the laboratory is provided.

The department is also equipped with a card index of metallurgical literature, covering all of the subjects of interest very completely. It is at the service of students.

Metallurgy 1

General Metallurgy: This course consists of lectures on the physical properties of metals; on alloys, their types, nature, and properties; fuels; refractory materials; thermal measurements; discussion of metallurgical principles; slags and furnace products, and their nature; types of furnaces and furnace construction; the means of supplying and heating blast; thermo-chemistry, including a discussion of chemistry at high temperatures; typical metallurgical processes, and the general economic considerations of metal-

lurgy, such as buying and selling of ores and metallurgical products. Students are required to do outside reading from references given in the class room, and hand in for examination papers on topics assigned. Laboratory work covering part of this course is carried out in the Senior year, and is described under Metallurgy 7.

Junior Year, Second semester: Three lecture periods per week.

No text book required. Chief reference work, Roberts-Austen, Introduction to the Study of Metallurgy.

Metallurgy 2

Iron, Steel, and Other Alloys: This course consists of lectures on alloys, their classification, structure, properties, metallography, taking up more particularly iron and steel. The hardening and tempering of steel is taken up in detail. The metallurgy of cast iron, wrought iron and steel is discussed in principle, but not in great detail. Especial attention is paid to the principles and chemistry of the iron blast furnace and to the Acid Bessemer process, and to the Basic Open Hearth process. Statistics of the iron and steel industry are given. The student is required to do considerable outside reading. Laboratory work in connection with this course is described under Metallurgy 7.

Senior Year, First semester, seven weeks: Five lecture periods per week.

Text book: Howe's Iron, Steel and Other Alloys.

Metallurgy 3

The Metallurgy of Copper and Lead: This course consists of lectures on the modern metallurgy of copper and lead. It discusses the types of copper and lead ores and the methods suitable for the treatment of the different types of ores. The principles of the reverberatory process for copper are discussed in detail, as it brings out clearly the chemistry of copper. Matte smelting for copper ores is discussed, both pyrite smelting and ordinary matte smelting being taken up in detail, also the roasting of copper ores. This is followed by the discussion of the Bessemerizing of copper mattes and the electrolytic refining of blister copper. Wet methods for copper ores are discussed. This is followed by a discussion of the blast furnace smelting of lead ores, including the roasting of ores, composition of lead slags, the products of the furnace, etc. The practice of large centrally located plants, treating both mixed lead and copper ores is taken up; also the reverberatory smelting of lead ores and the desilverization of lead bullion and the refining of lead. Laboratory work for this course is described under Metallurgy 7.

Senior Year, First semester, eight weeks: Five lecture periods per week.

No text book required. Reference works: Hofman's Metallurgy of Lead; Peters' Metallurgy of Copper; Ile's Lead Smelting; Schnabel's Handbook of Metallurgy.

Metallurgy 4

The Metallurgy of Gold and Silver: This

course consists of lectures on the metallurgy of gold-silver, taking up, first, modern stamp mill practice; discussing in detail, mortar boxes. stamps, screens, general battery construction, etc., and the influence of weight of stamp, screen mesh, mortar box dimensions, amount of water on results obtained. Inside and outside amalgamation is taken up in detail; the general mill arrangements; clean up; the influence of other processes following amalgamation is discussed. This is followed by a discussion of the cyanide process for gold and silver ores; wet and dry crushing; crushing in cyanide solution; the separation of sands from slimes; the treatment of sands by percolation; the treatment of slimes by decantation, and filter pressing; the precipitation of gold and silver by the various methods in use; methods of cleaning up and the smelting of cyanide precipitates. The general chemistry of cyanidation and the proper performance of laboratory experiments is discussed. This is followed by lectures on the chlorination process, particularly on the roasting of gold ores and barrel chlorination; the chloridizing roasting of silver ores; pan amalgamation; leaching process for silver ores, etc., concludes the course. Laboratory work for this course is described under Metallurgy 7.

Senior Year, Second semester, thirteen weeks: Five lecture periods per week. The remaining two weeks are given to a brief discussion of the metallurgy of zinc.

No text book required. Reference works: Julian & Smart's Cyaniding of Gold and Silver

Ores; T. A. Rickard's Stamp Milling of Gold Ores; Henry Louis' Handbook of Gold Milling.

Metallurgy 5

This is a course discussing in greater detail some of the features of Metallurgy 1. It comprises lectures on the physics and chemistry at high temperatures; pyrometry, including a discussion of the principles of the measurements of high temperatures by different methods; Calorimetry, including the determination of calorific power of fuels, and the specific heats of slags, etc., and work in general Metallography. The laboratory work for this course is described under Metallurgy 8.

Senior Year: Four lecture periods per week throughout the year.

(Note: Course 5 is a metallurgic option replacing Geology 4, in the regular mining engineering course. If the majority of the students who elect this work so desire, Course 5, instead of being as above will be replaced by lectures, dealing in detail with the metallurgy of gold, chiefly amalgamation and cyanidation, similar to Course 4, but greatly enlarged in detail and usefulness.)

No text book required. Reference works: LeChatelier & Boudouard's High Temperature Measurements; J. H. Vogt's Silicat-Schmelz Losungen, etc., Volumes of the Metallographist, and other works.

Metallurgy 6

Assaying: This course is taught by lectures

and by laboratory work, based on the lectures. Elementary chemistry, qualitative and quantitative analysis are pre-requisites, being necessary for a thorough understanding of the work.

The work in the laboratory includes assaying of reagents; the testing of ores to discover their nature; the study of oxidizing and reducing reactions occurring in assaying; the study of typical assay slags; the assaying of pure gold and silver ores by crucible and scorification methods; the special assaying of copper and zinc ores containing gold and silver; the assaying of arsenical and antimonial ores for gold and silver;the study of cupellation and the factors which influence its results; the assaying of impure ores by the roasting, the nitre, and the excess litharge methods; the assaying of telluride ores, lead bullion, and cyanide precipitates for gold and silver; the assaying of gold and silver bullion; the assaying of lead, tin, bismuth, and antimony ores for their respective base metals; the dry assay of mercury ores for mercury, and concentration and free milling tests on a laboratory scale.

Junior Year, Second semester: Two lecture periods and nine laboratory hours per week.

Text book: Fulton's Notes on Assaying. (Mimeographed.)

Metallurgy 7

Metallurgical Laboratory: Laboratory practice in pyrometry; the calibration of the thermo couple; taking of cooling curves and freezing point curves; heat curves of furnaces; the examination of iron and steel and other alloys under

the microscope; the preparation of metal sections for the microscope; the roasting of ores, noting the formation of sulphates, etc.; the desilverization of lead bullion by means of zinc; the electrolytic deposition of copper; the roasting of gold and silver ores; experiments with the cyanide process, including the titration of pure and mill solutions with silver nitrate, analysis of cyanide solutions, cyanide experiments with small lots of ore in the laboratory to determine extraction, etc.; finally, at the end of the term, a mill run or smelter run on a large lot of ore.

Senior Year: First semester, six laboratory hours per week; second semester, three laboratory hours per week.

Text book: Clennell's Chemistry of Cyanide Solutions.

Metallurgy 8

Metallurgical Laboratory: Laboratory practice in pyrometry, much more detailed than described for Course 7, including other pyrometers than the thermo couple; determination of calorific power of fuels by the bomb calorimeter; determination of the physical constants of slags, including their specific heat, melting points; microscopic examination of slags, mattes and other furnace products; the working out of metallurgical problems which may suggest themselves.

Senior Year: Three laboratory hours per week throughout the year.

Note: The note applying to Course 5 applies here also. The work of this course is accepted in part as thesis work.

Metallurgy 9

Metallurgical Thesis: Subject assigned by the professor in charge or chosen by the student.

Senior Year: First semester, three laboratory hours per week; second semester, six laboratory hours per week.

Department of Geology and Mineralogy

PROFESSOR O'HARRA.

Library, Laboratory, and Field Facilities

A good, well equipped departmental library is placed convenient to the lecture and laboratory rooms and students are required to make intelligent use of the literature contained therein.

The laboratory equipment and the museum collections, elsewhere described, furnish indispensable materials for practical work of many kinds.

Field facilities are unsurpassed. Unusual opportunity is afforded for study in the field of the various geological horizons, including important and valuable economic deposits. Within a few miles of the School the student may observe upturned strata of nearly all geological ages. Twenty miles southwest of Rapid City is the Harney Peak granite area, with its lavish variety of mineral specimens. Surrounding this is a wonderful exposure of Algonkian metamorphic rocks cut in many places by auriferous quartz veins. The Cambrian, Carboniferous, Triassic, Jurassic, and Cretaceous are extensively developed. The famous White River Bad Lands of Tertiary age lie to the southeast of the Hills and afford fossils which have made the region known

wherever the science of Paleontology is taught. In the northern part of the Hills important igneous rocks, such as rhyolite, phonolite, andesite, dacite, etc., occur in the form of dikes, sheets and laccoliths. Closely associated with these in slates, quartzites, and limestones, gold ores of the greatest importance are found.

In the autumn, short field excursions are made by the class to near by points of interest and occasionally a visit of several days is made to more distant localities. Thus the student, in addition to lecture and laboratory instruction, has the advantage of systematically directed field study and with the information thus gained, he should be able to undertake for himself the working out of practical field problems.

Geology 1

General Geology: This course is arranged primarily as introductory to all work in geology and mineralogy. It extends throughout the Freshman year and embraces a comprehensive study of the fundamental principles of geology. The course includes brief, but careful study of dynamical, stratigraphical, structural, chemical, and historical geology, and is conducted by means of lectures, text books, and laboratory work, and frequent excursions to points of particular interest. Under dynamic geology, the atmospheric, aqueous, igneous, and organic agencies are discussed with reference to their bearing on the present and past condition of the earth's surface. Stratigraphical and structural geology consider the conditions of deposition of sediments and of the disturbance of rock masses. A portion of the

time allotted to these subjects is devoted to the study of such minerals and rocks as enter most largely into the structure of the earth's surface; also to the methods of geological surveying, including mapping, section making, and special problems. Chemical geology includes the study of the general relation which chemistry bears to geological phenomena, such as the formation, metamorphism, and degeneration of rocks, and the origin and alterations of the various kinds of mineral deposits. Under historical geology, the physical history of the earth is discussed, the classification and distribution of sedimentary rocks studied, and the methods of correlation explained. The course aims to equip the student with useful information concerning the phenomena and history of the earth, so that he may know the methods used in geological research, and will better understand how to interpret facts gained in the study of economic deposits.

Freshman Year: Four lecture periods and three laboratory hours per week throughout the year

Text Book: Chamberlin and Salisbury's Geology, Vol. I, Geologic Processes and Their Results.

Mineralogy 1

General Mineralogy: This course is planned to develop such information as may be needed for quick and accurate determination of mineral species in the field. The course is based on lectures, text book, and laboratory work and embraces frequent rigid quizzes on features of chief importance. The physical properties of minerals are dealt with in the early part of the course; a

brief study of Crystallography introducing this part of the subject. This is followed by a careful physical study of the chief economic and rock-making minerals in systematic order. Good collections, containing most of the common species of minerals and many of the rarer ones, are arranged for convenient use in the laboratory and museum. Thoroughly accurate observation of labeled specimens from many localities is insisted upon, and every attention is given to simple, practical methods in the determination of unknown materials.

Sophomore Year, First semester: Three lecture periods and three laboratory hours per week.

Text Book: Moses and Parson's Mineralogy, Crystallography, and Blowpipe Analysis.

Mineralogy 2

Blowpipe Analysis: This course is closely associated with Course 1 and continues the same object in view, i. e., the teaching of quick methods of mineral determination where the conveniences of well equipped laboratories are not available. It is chiefly a laboratory study, occupying one lecture period and six laboratory hours throughout the second semester of the Sophomore year. Approximately the first third of the semester is devoted to the study of blowpipe methods, known minerals being chiefly used. After this, the student is given only unlabeled specimens, the nature and name of which he is required to learn, keeping for reference a detailed record of all results obtained during the process of determination. It is expected that, upon completing this and the

preceding course, the student will have gained a fair working knowledge of approximately two hundred of the common minerals, including the chief features of their distribution, uses, value, and output.

Sophomore Year, Second semester: One lecture period and six laboratory hours per week.

Text Book: Brush-Penfield's Determinative Mineralogy and Blowpipe Analysis.

Geology 2

Physical Geology, including Metamorphism: The purpose of this course is to bring out in some detail, certain important features, too briefly considered in General Geology, that have close connection with the subjects of Petrography and Economic Geology which follow. Processes of disintegration, denudation, and deposition, crustal disturbances, and metamorphic influences receive attention, particularly with reference to their immediate or ultimate relation to ore formation. The physical action of underground water commands careful study, and where physical phenomena are closely connected with chemical activity, the chemical processes in the influencing of mineral reorganization receive proper consideration. In this, as in all other courses described, features of economic importance will receive particular attention, but it should be understood by the student, that the full aim of the course is to afford opportunity for as thorough and comprehensive a grasp of the subjects in hand as the time devoted to them will allow.

Junior Year, First semester: Three lecture periods and three laboratory hours per week.

Text Book: Lecture notes.

Geology 3

Petrography: This course is intended especially for mining students who need some training in rock determination, but who have opportunity to devote only a brief time to the subject. It embraces the macroscopic and microscopic study of specimens and is conducted by means of lectures, text book, and laboratory work. The lectures are devoted to the discussion of petrographical methods, the nomenclature of rock species, the principles of rock classification, and the origin, distribution, modes of occurrence, alterations and relations of rock masses. The laboratory work embraces the study of hand specimens of rocks, the making of thin rock sections and the examination of such sections by means of the petrographical microscope. Little more than a short summary is given of the refined methods of microscopic analysis, most of the time being devoted to the simpler field methods of determining and classifying the commoner rock types. Two good Zeiss petrographical microscopes, together with necessary accessories, are available for use. There is also a Krantz collection of 250 rock types in hand specimens and in thin sections, and a fairly complete series of Black Hills rocks, a number of which have been thin sectioned for study.

Junior Year, Second semester: Three lec-

ture periods and three laboratory hours per week.

Text Book: Kemp's Handbook of Rocks.

Geology 4

Economic Geology: This course runs throughout the Junior year and includes study of the origin, modes of occurrence and uses of economic mineral products. Beginning with this year, about one half of the first semester will be given to the study of non-metallic products. This will include the origin, nature, relations, and value of coal, petroleum, natural gas, salines, building stone, clays, cement materials, fertilizers, abrasives, gems, etc. The rest of this course will be devoted to the study of metallic products, such as gold, silver, copper, iron, lead, zinc, platinum, mercury, nickel, etc. In this, much attention is given to the study of the principles of ore deposition and to the historical development of the theories connected therewith. Careful attention is given to the chief types of deposits and particularly to localities noted for their wealth of output.

Maps, specimens, and original papers are freely used. Attention is given to the history of mineral development, of the life and comparative importance of various regions and of the influence which economic deposits have exerted upon the regions or countries in which such deposits have been found.

The necessity of individual examination by the student of the best, up-to-date literature is insisted upon, and a reasonable ability to properly use such literature is required. Much attention is devoted to the study of the many economic in-

terests of the Black Hills region and observation of the deposits in the field is encouraged.

Junior Year: Four lecture periods per week throughout the year.

Reference Texts: Beck-Weed's Nature of Ore Deposits; Ries' Economic Geology of the United States; Kemp's Ore Deposits of the United States and Canada.

DEPARTMENT OF ENGINEERING

PROFESSOR EHLE. MR. JEWETT. MR. BANGS.

The aim of this department is to give the student such training in the class room, drawing room and field as will properly fit him for his career as a mining engineer.

The department occupies two well lighted drawing rooms, 24 by 34 and 24 by 30 feet, in size; lecture room and offices. The rooms are furnished with suitable drawing desks which have separate lockers for each student.

The work of this department extends over a period of three years and includes the following courses:

Engineering 1

Mechanical Drawing: Practical work in the drawing room accompanied by lectures as needed. The work is carried on chiefly by means of individual instruction. The course includes the care and use of instruments; the mounting of sheets; simple geometric construction; orthographic projection;

lettering, both free hand and mechanical lettering of titles.

Students taking this course should provide themselves with the following list of supplies, most of which may be obtained from the supply room of the department, at cost:

One set of drawing instruments containing: 1-6 in. compasses with pen, pencil and needle points, 1-6 in. dividers, 1-5 ½ in. ruling pen, 1-3 ½ in. steel spring bow divider, 1-3 ½ in. steel spring bow pencil, 1-3 ½ in. steel spring bow pen; 1 bottle of black drawing ink, 1 bottle of red drawing ink, 1 6H drawing pencil, 1 pencil pointer, 2 irregular curves (Dietzgen, No. 10 and No. 19), 1-7 in. 30° by 60° triangle, 1 1-8 in. 45° triangle, 1 pencil eraser, 1 ink eraser, 1 sponge rubber, 1 bottle mucilage or glue, 1 T square with 30 in. blade, 1-4 ½ in. protractor, 1 doz. thumb tacks, 1 pulp board, 18 sheets Whatman's H. P. 17 by 22 in. drawing paper.

Drawing boards and key for locker are furnished by the school on the payment of a fee of $1 per year; 50 cents of this is refunded on return of key.

Freshman Year: Six laboratory hours per week throughout the year.

Text books: Morris' Geometrical Drawing for Art Studens; Students' Alphabets.

Engineering 2

Descriptive Geometry: The work in descriptive geometry is necessary in order that the

second and third year drawing may be done intelligently. The course is taken up as outlined in Hall's Descriptive Geometry. It includes the projection of the point and line and the representation of planes and problems relating thereto; generation, classification, and intersection of surfaces.

Sophomore Year: One lecture period per week throughout the year.

Text book: Hall's Descriptive Geometry with Plates.

Engineering 3

Mechanical Drawing: This course is supplementary to the class room work of descriptive geometry and mechanism. The work of this course takes up the development and intersection of plane and curved surfaces. It is designed to run parallel to the course in mechanism, consequently it includes the drawing of cams and gear teeth and the analysis of link work.

Sophomore Year: Six laboratory hours per week throughout the year.

Text book: Morris' Geometric Drawing for Art Students.

Engineering 4

Mechanism: This course is given by means of lectures and recitations. The work takes up the laws which govern the moving parts of the machine; the design of cams, gear

teeth, and link work. The various parts of the machine are discussed in the class room and then are carefully and accurately constructed on the drawing board so that the student may gain a clear idea of the design of the various mechanical movements. This course furnishes a basis for the work of Engineering 3 in the second semester of the Sophomore year.

Sophomore Year: Second semester, two lecture periods per week.

Text book: Stahl & Wood's Elementary Mechanism.

Engineering 5

Mechanical Drawing: This course is for the purpose of giving instruction in methods of representing machine parts. The student is required to make free hand sketches of various parts and then make from his sketch a finished working drawing, properly lettered and dimensioned. Tracing and blue printing are part of the course.

Junior Year: First semester, six laboratory hours per week.

Engineering 6

PROFESSOR EHLE.

Graphical Statics: The object of this course is to give an understanding of the theory of the graphical solution of internal stresses in a framed structure, arising from steady and moving loads, from the pressure of the wind, etc. The student

is required to determine by graphical methods on the drawing board, the nature and amount of internal stresses in the various members of such simple roof and bridge trusses and head frames as are assigned him.

Junior Year: First semester, one lecture period and three laboratory hours per week.

Text book: Hosking's Elements of Graphical Statics.

Engineering 7

Surveying: It is the desire of the department to bring, as far as is practicable, theory and practice side by side. For this reason, the discussions in the class room are confined to such principles as can be given a practicable application in the field or drawing room.

The institution is provided with all the instruments and accessories necessary to carry on the work. Additional instruments are purchased as the need for them arises.

For the performance of the field work, the class is divided into squads with just a sufficient number in each to properly carry on the work. Each student is required to take his turn at every part of the work; to use each instrument as the occasion demands; to make his own notes and computations; and finally to accurately plot them in the drawing room.

The course outlined is as follows: Linear

measurements by means of pacing and chain or tape; adjustment and use of the engineer's transit and level; traversing; principles of land surveying; adjustments and use of the plane table; mine surveying, including the location and patent surveying of claims; shaft plumbing and underground connections; adjustment and use of the solar instrument; geodetic surveying, including the measurement of a base line; measurement of horizontal angles; computations for the adjustment of the triangulation system; determination of the meridian by means of the solar instrument; determination of latitude; direct solar observation and observation on Polaris; measurements of volumes. Railroad surveying will receive as much time as the conditions will permit.

Junior Year: First semester, three lecture periods and nine hours field work per week. Second semester, two lecture periods and nine hours field work per week.

Text book: Johnson's The Theory and Practice of Surveying.

Engineering 8

Hydraulics: The student takes up this course with a knowledge of hydrostatics from his work in Physics 3, and is thus prepared to commence with hydraulics proper, or the study of the laws governing the motion of water. He learns the methods of commercial measurement of water by both weirs and orifices. The problems include the computations of diameters of pipes; pressures,

and energy of confined water; dimensions of channels and ditches; velocity of flow, etc.

The School is favorably situated for field work in hydraulics. Rapid creek is a mountain stream with a fall of about 1.6 per cent., offering splendid facilities for weir and velocity measurements; two large irrigation ditches are adjacent to the School, and Rapid City has three water-power plants within the city limits. The students thus have opportunity to visit and study hydraulic power plants in successful operation.

In the latter part of the course the student designs and makes drawings for a complete water-power plant, calculating the size of flumes and ditches, cost of material and excavation; makes plans for wheels, tailrace, etc., as a practicing engineer would be required to do.

Senior Year: Two lecture periods per week throughout the year. Second semester, three laboratory hours per week.

Text book: Mansfield Merriman's Treatise on Hydraulics.

Engineering 9

Thermo-Dynamics: This course begins with a discussion of the theory underlying the operation of heat engines. The theory of the operation of the ideal engine is developed, and the principles governing the actions of steam and gas engines, air compressors and refrigerating machines are fully discussed.

Senior Year: First semester, two lecture periods per week.

Engineering 10

Design of Power Plants: This course applies practically the principles developed in the preceding one. It embraces the history of the development of the steam engine, and a study of the types in successful use; the application of the indicator and Prony brake, and the testing of boilers and fuels.

The School has three 40 horse-power boilers and a 40 horse-power Corliss engine; also a gasolene and a kerosene engine. This apparatus is available for laboratory work in this line.

Under the head of hydraulics, the Seniors design a water power plant. (See hydraulics.) In this course the students learn to design the necessary electrical equipment to commercially transmit this power to distant points.

Senior Year: Second semester, two lecture periods per week.

DEPARTMENT OF CHEMISTRY

PROFESSOR COOLBAUGH. MR. VAN NUYS. MR. BETTERTON.

The courses in chemistry are designed to give to mining and metallurgical engineering students the knowledge of chemistry most essential to their work. Especial emphasis is given to the laws underlying the science, the relations of the elements, separations, estimations, etc.,

being made with these principles in mind. It is the purpose to excite in the student an interest in experimentation, to cultivate methods of accuracy and rapidity in manipulation, and to teach the proper correlation of the results of experiments.

FOR PREPARATORY STUDENTS

Chemistry 1

Elementary Chemistry: A study of the principal elements and compounds and a drill in the skillful manipulation of apparatus.

Three lecture periods and six laboratory hours per week throughout the year.

Text book: William's Elements of Chemistry.

FOR ENGINEERING STUDENTS

Chemistry 2

General Chemistry: This course should give the student a knowledge of the principal theories and laws of the science. The following subjects are discussed in an elementary way: Atoms and molecules; gases; liquids; solids; solutions; thermo and electro-chemistry; and chemical equilibrium. Some time is also given to a study of inorganic chemical manufacturing industries, among them the manufacture of acids, alkalis, clays and cements, cyanides, gas and ammonia. In addition, there is a brief study of the metallic elements, introducing elementary met-

allurgy as those of commercial importance are considered.

Freshman Year: Three lecture periods per week throughout the year.

Reference books: Richter's Inorganic Chemistry; Ostwald's Principles of Inorganic Chemistry; Thorp's Outlines of Industrial Chemistry.

Chemistry 3

Qualitative Analysis: The class room work in qualitative analysis begins with an outline of the general scheme of analysis. Then follows a minute study of the metals and acid radicals with their detections and separations. Emphasis is placed on the principles of oxidation and reduction; the law of mass action; theory of ionization and hydrolysis. Separations are made before the class in order to give ideas of the correct use of reagents and methods for rapid manipulation.

Freshman Year: Two lecture periods per week throughout the year.

Reference books: Prescott & Johnson's Qualitative Analysis; Treadwell's Qualitative Analysis.

Chemistry 4

Quantitative Analysis: The class room work in quantitative analysis consists of: Discussions of the relative merits of methods applied in the laboratory; the study of articles and reviews from chemical periodicals, and the subject of chemical calculations.

Sophomore Year: Two lecture periods per week throughout the year.

Reference books: Miller's Notes on Quantitative Analysis; Miller's Calculations of Analytical Chemistry; Treadwell's Quantitative Analysis; Sutton's Volumetric Analysis.

Chemistry 5

Metallurgical Chemistry: This course is to familiarize the student with the analytical methods used in conjunction with metallurgical processes. The subjects studied are: The technical methods connected with iron, steel, zinc, lead, and copper metallurgy; also bismuth, mercury, cadmium, nickel, the rare metals that are commercially important and electrolytic slimes. Prerequisites: Chemistry 2, 3, and 4, or equivalents.

Junior Year: One lecture period per week throughout the year. Required of Juniors taking the metallurgical option.

Chemistry 6

Qualitative Analysis: The laboratory work covers the separation of metals and acids in solutions; dry salts; minerals; slags; and alloys. Numerous tests are made with the blowpipe and the spectroscope is used for the detection of the alkali and alkaline earth metals.

Freshman Year: Nine laboratory hours per week throughout the year.

Chemistry 7

Quantitative Analysis: In the laboratory the course covers the subject of mineral analysis, including both gravimetric and volumetric methods. The analyses included in the course are:

Magnesium sulphate, sodium or other chloride, potassium alum, coal, iron, ammonium alum, iron ore, pig iron, spiegel or manganese ore, copper ore or copper matte, brass, lead ore, chromic iron, arsenic ore, antimony ore, slag, and gas analysis.

Sophomore Year: Nine laboratory hours per week throughout the year.

Chemistry 8

Quantitative Analysis: Laboratory work corresponding to Chemistry 5.

Junior Year: Six laboratory hours per week throughout the year.

DEPARTMENT OF MATHEMATICS

PROFESSOR MCLAURY. MR. HUMBERT.

The engineer, from the very nature of his work, must of necessity meet many difficult problems. His success will depend on his ability to solve them. As it is impossible to tell in advance just what experience a given student will meet, that course is best which results in mental power. It is not a question of what the student has done,

but what he can do. Has he a comprehensive grasp of the subject; has he thoroughly mastered the principles; can he apply these principles to kindred subjects?

The aim of this department will be to give the student a thorough knowledge of the principles of mathematics so as to enable him to apply them readily to the solution of practical problems. Original work is encouraged, and an effort is made to cultivate the habit of exact logical reasoning, and to stimulate independent thought. Both rapidity and accuracy are expected in all mathematical work. The great importance of mathematics as the basis of a scientific education justifies the requirement of all elementary courses, as a prerequisite to the Mining Engineering Course.

FOR PREPARATORY STUDENTS

Mathematics 1

MR. HUMBERT.

Algebra A: This course is for beginners, and covers the first eleven chapters of Wentworth's Higher Algebra. The principal subjects are: Fundamental operations; parentheses; simple equations; special rules for multiplication; and division factors; common factors and multiples; fractions; fractional equations and simultaneous equations of the first degree.

First Year, Scientific Preparatory Course.
Second Year, College Preparatory Course.
First semester, five lecture periods per week.
Text book: Wentworth's Higher Algebra.

Mathematics 2

MR. HUMBERT.

Algebra B: This course is a continuation of algebra A and completes the first twenty chapters of Wentworth's Higher Algebra. The principal subjects are: Problems involving two unknown numbers; simple indeterminate equations; inequalities; involution and evolution; theory of exponents; radical expressions; imaginary expressions; quadratic equations; simultaneous quadratic equations.

First Year, Scientific Preparatory Course.

Second Year, College Preparatory Course.

Second semester, five lecture periods per week.

Mathematics 3 and 4

MR. HUMBERT.

Plane Geometry: Special attention is given to original work throughout this course.

Second Year, Scientific Preparatory Course.

Third Year, College Preparatory Course.

Five lecture periods per week throughout the year.

Text book: Phillips & Fisher's Geometry.

Mathematics 5

PROFESSOR MCLAURY.

Solid Geometry: Third Year, Scientific Preparatory Course.

Fourth Year, College Preparatory Course. (Optional.)

First semester, five lecture periods per week.

Text book: Phillips & Fisher's Geometry.

Mathematics 6

PROFESSOR MCLAURY.

Algebra C: This course is a continuation of algebra B, but will include a short review of a few of the more important topics in algebra A and B. The principal subjects are: Properties of quadratics; ratio, proportion, and variation; arithmetical and geometrical series; indeterminate coefficients; binominal theorem; logarithms; variables and limits; series; general properties of equations; and numerical equations.

Third Year, Scientific Preparatory Course.

Second semester, five lecture periods per week.

Text book: Wentworth's Higher Algebra.

FOR ENGINEERING STUDENTS

No course in Algebra is offered in the Engineering Department. However, in the following courses, particular pains will be taken to explain all the more difficult algebraic processes as they occur. Several subjects in higher algebra will be discussed, each at the point where it is required for immediate application. Students who have not studied algebra for a year or more, should

make a careful review before entering school, for a thorough knowledge of the elements of algebra is essential to the successful completion of all subsequent courses.

Mathematics 7

PROFESSOR MCLAURY.

Trigonometry: Plane, analytical and spherical trigonometry: Considerable attention is paid to the consistent and scientific development of the fundamental conventions and definitions, and to the derivation and transformation of trigonometric expressions. Many practical problems are solved.

Freshman Year: First semester, five lecture periods per week for sixteen weeks.

Text book: Phillips & Strong's Trigonometry.

Mathematics 8

PROFESSOR MCLAURY.

Analytic Geometry: This course includes the following subjects: Loci; straight lines; transformation of co-ordinates; circles; conic sections; the general equation of the second degree and higher plane curves.

The theory will be developed by lectures.

Freshman Year: Second semester, five lecture periods per week for eighteen weeks.

Text book: Nichol's Analytic Geometry, with Smith & Gale, Puckle, Ashton, and C. Smith for reference.

Mathematics 9

PROFESSOR MCLAURY.

Differential Calculus: The text book work is supplemented by lectures. This course will include the discussion of a few subjects in higher algebra and will be preceded by a short course in solid analytic geometry, based on Nichol's Analytic Geometry.

Sophomore Year: First semester, five lecture periods per week.

Text book: Osborn's Calculus.

Snyder & Hutchinson, Granville, and Williamson are used for reference.

Mathematics 10

PROFESSOR MCLAURY.

Differential and Integral Calculus: This course is a continuation of the last course and will include the most of the work in Osborn's Calculus.

Sophomore Year: Second semester, five lecture periods per week.

Mathematics 11

PROFESSOR MCLAURY.

Mechanics 1: The theory is developed by lectures. The aim is to present the fundamental principles in as clear and simple a manner as possible. Many problems will be solved to enforce the principles and to develop ability in the student to apply what he has learned to practical problems. Particular effort is made to cultivate the power of the student to use calculus methods when

needed. The course includes the following subjects:

Statics: First principles; units; composition and resolution of concurring forces; composition and resolution of forces acting on a rigid body; conditions of equilibrium; center of gravity; friction; virtual velocities; machines; the funicular polygon and the catenary.

Kinematics: Rectilinear and curvilinear motion; composition and resolution of acceleration; angular velocity and angular acceleration; projectiles, etc.

Kinetics: Laws of motion; motion under the action of a variable force; motion in a resisting medium; constrained motion; the simple pendulum; centripetal and centrifugal forces.

Junior Year: First semester, five lecture periods per week.

Text book: Bowser's Analytic Mechanics; the works of Church, Hoskins, Johnson, Todhunter, and Routh, are used for reference in this and the following course.

Mathematics 12

PROFESSOR MCLAURY.

Mechanics 2: The topics discussed include:

Kinetics (Continued): Impact; work and energy; moment of inertia.

Strength of Materials: The resistance and elasticity of the materials of engineering; fundamental assumptions of the common theory of beams; distribution of stresses in beams; shearing forces, bending moments, and deflections of beams; the common and exact theory of

torsion, flexure, elastic limits; working stresses and ultimate resistance of cast-iron, wrought iron, steel, and timber; pipes and riveted joints; posts and columns; the design of posts, beams, shafts, etc.

Junior Year: Second semester, four lecture periods per week.

Text book: Merriman's Mechanics of Materials.

DEPARTMENT OF PHYSICS

MR. BANGS.

The courses offered by the department are as follows:

FOR PREPARATORY STUDENTS

Physics 1

Elementary Physics: The aim of this course is to give the student a good foundation for the advanced work of Physics 3 and 4, in mechanics of solids and liquids, and to cover the subject of sound so thoroughly that but little further attention need be given it in the advanced work.

Lectures and recitations are held for the development of the theory and its application to practical problems. As the course is accompanied by ample laboratory practice, very few demonstrations are required in lecture periods.

The subjects treated chiefly are: Sound, light, heat, and electricity. The modern theories of light are carefully developed and with the aid of these, the laws of reflection, refraction, dis-

persion, and polarization are explained thoroughly. In the subjects of heat and electricity, the object is to give the student such a knowledge of the fundamental laws as will fit him for more advanced work. The study of heat will serve as an introduction to the subject of thermo-dynamics, and the work in electricity will be a foundation for the more complete treatment in the advanced course.

Third Year, Scientific Preparatory Course.

Fourth Year, College Preparatory Course. Three lecture periods per week throughout the year.

Text book: Carhart & Chute's High School Physics.

Physics 2

Laboratory work in connection with Physics 1: In this course, the student is led to realize the ideal laws of physics and the data from which these laws are deduced, rather than to rigorously apply these laws before he has a sufficient knowledge of mathematics to make such application possible. The work includes the study of the properties of matter; the use of the vernier and micrometer; the determination of the density of different alloys, crystals and minerals; and the use of various instruments of precision. The laws of gravitation, fluid pressure and acoustics are made clear by suitable experiments.

In the second semester, the study of light is commenced. The student developes the law of intensity and becomes proficient in the use of the photometer. A study of reflection, refraction, and

the spectroscope follows. This completes the laboratory work in light, with the exception of spectrum analysis and the polariscope. These subjects are treated in the advanced course.

The experimental work in heat takes up the construction and testing of various types of thermometers; the coefficient of expansion of various substances, particularly gases; and the subject of specific heat, which receives careful attention.

The course in electricity is designed as a foundation for a more complete laboratory treatment in the advanced class. The student learns to construct and test the different batteries in common use. He becomes familiar with the use of the Wheatstone bridge, galvanometers, electrometers and all the other common instruments of electrical measurement. The laboratory is well equipped with electrical measuring instruments and has a 6 H. P. engine and dynamo. The student is required to hand in complete reports of all experiments, with sketches of apparatus used, descriptions of methods, and with results deduced and compared with known values.

Third Year, Scientific Preparatory Course.

Fourth Year, College Preparatory Course.

Six laboratory hours per week throughout the year.

FOR ENGINEERING STUDENTS

Physics 3

Advanced Physics: As a prerequisite for this course, the student should have the experience of Course 1, and be familiar with higher algebra

and analytics. The subjects treated in the first semester are: Mechanics, hydrostatics, sound, and light. As sound is given a very complete treatment in the elementary course, it occupies but a short time here. The mechanics of fluids receives the benefit of the time thus saved and the complete treatment here serves as an introduction to the study of hydraulics in the Senior year. The work of the semester ends with a review of the principles of light, and a discussion of the spectroscope and polariscope. In the second semester the course is continued by treating the subjects heat, electricity, and magnetism. In the subject of heat, particular attention is given to the expansion of gases and vapors; specific heat, and the relation of heat and energy, that the student may have a good foundation for thermo-dynamics.

The subject of electricity receives detailed and careful consideration. The laws of electrolysis, resistance, and potential are developed, and a comprehensive study of electrical measuring instruments, dynamos, motors, etc., is entered into. The relative advantages of alternating and continuous currents for different purposes is pointed out. This course gives the student good preparation for his subsequent work in mining and metallurgy.

Sophomore Year: Two lecture periods per week throughout the year.

Text book: Carhart's University Physics.

Physics 4

Laboratory work in connection with Physics 3: The aim of the laboratory work in this course

is not so much to perform a large number of experiments, as to learn to do the work with care and accuracy. Determinations are made of the coefficient of friction; buoyancy of the atmosphere; acceleration of gravity, etc. Complete reports of all experiments are required, and when possible, they are accompanied by appropriate curves.

In the experimental work in heat, particular attention will be given to such practical determinations as the calorific power of fuels; melting and boiling points; and the expansion of vapors and gases.

The laboratory is well equipped for an extensive course in electrical testing. The apparatus includes a permeameter, magnetometer, condensers, induction coils, static machines, X ray tubes, etc. Dynamos, motors, and lamps are available for the purpose of making tests of commercial efficiency. The school machine shop is at the disposal of students for the purpose of constructing apparatus for research work.

The general application of electricity to mining makes this course of value and interest to the mining engineer.

Sophomore Year: Three laboratory hours per week throughout the year.

DEPARTMENT OF ENGLISH

PROFESSOR MCLEARIE.

The aim of this department is to give the student a command of good idiomatic English, and to aid him in the development of the art of

expression. Especial emphasis is laid upon the importance of good composition in technical work. Attention is called to the absolute necessity that every professional man should be able to express his thoughts with clearness and accuracy.

FOR PREPARATORY STUDENTS

The study of English in the preparatory courses is pursued with two ends in view: First, to enable the student to speak and write clearly and effectively; second, to develop his appreciation of good literature.

English 1

Composition 1: A study of the fundamental principles of English composition, with daily written exercises on simple subjects. This course includes a review of syntax; study and practice in the principles of punctuation; letter writing and business forms.

First Year: Scientific and College Preparatory Courses. Five lecture periods per week throughout the year.

Text books: Kimball's The Structure of the English Sentence; Maxwell & Smith's Writing in English, supplemented by Hill's Foundations of Rhetoric; Hart's Prose Composition, and Williams' Composition and Rhetoric.

English 2

Rhetoric and Composition 2: Careful study of the rhetorical principles; the analysis and study of models; and the writing of compositions. This is supplemented by an intensive reading of

The Sir Roger de Coverly Papers; The Merchant of Venice; Julius Caesar; The Ancient Mariner; Vicar of Wakefield; Gareth and Lynette; Irving's Life of Goldsmith; and The Princess.

Second Year: Scientific and College Preparatory Courses. Five lecture periods per week throughout the year.

Text books: Gardiner, Kittredge & Arnold's Elements of English Composition; Herrick & Damon's Rhetoric; Clark's Rhetoric; and Genung's Rhetoric and Rhetorical Analysis.

English 3

English Literature and Composition 3: A brief historical view of English literature in its more significant periods, and in representative masterpieces. This course is based upon the requirements adopted for admission to the Freshman class in eastern universities.

Third Year: College Preparatory Course: Five lecture periods per week throughout the year.

Text books: Simond's History of English Literature; Painter's Introduction to English Literature; Halleck's History of English Literature.

English 4

American Literature and Composition 4: A survey of American verse and prose from colonial days to the present, with the reading and discussion of notable works. A thorough course of reading is required, and topics are assigned to each student for special investigation. Laboratory method.

Fourth Year: College Preparatory Course. Five lecture periods per week throughout the year.

FOR ENGINEERING STUDENTS

The courses in advanced composition are designed to give the engineering students such drill as will enable them to express themselves with ease, accuracy and elegance.

English 5

Composition 5: The elements of effective writing: This course gives both theoretical and practical instruction. The theory is taught by class room work based on standard text books. The practice is obtained by exercises written in the class room, and by weekly themes. At least one theme a week is required, and every theme is returned to the student to be revised or rewritten.

Freshman Year: Three lecture periods per week throughout the year.

Text books: Wendell's English Composition; Pearson's Principles of Expression.

English 6

Composition 6: This course supplements the work of the Freshman year by giving further practice in narrative, expository and argumentative writing. A study is made of the works of such authors as will aid in practical composition work. Three themes are required, each containing from 800 to 1,000 words. There will be a conference on each theme.

Sophomore Year: First semester, two lecture periods per week.

DEPARTMENT OF PREPARATORY SCIENCE

Preparatory Science 1

MR. HUMBERT.

Bookkeeping: The aim of this course is to present both the theory and the practice of accounting, by means of a system that will bring the technical practice, customs, and approved business forms of the counting house into the school room. Rational methods of presenting the subjects are utilized; the student begins to keep books under the instruction of an employer—he uses the ordinary papers and documents with which men transact business, making his original entries therefrom. He thus learns how the transactions assume form, and how the "historical record" logically follows.

He later works for an employer whose business expands into a simple partnership, and then into a firm of several members. The expanding business requires several departments and a branch store, and, as a natural sequence the books become more complex, and special columns appear as well as various auxiliary books. He later assists in forming a joint-stock company, and in keeping the books of several corporations, in one of which—a manufacturing company—he encounters a scientific, modern exposition of the "Voucher System" of accounting.

The theory side is presented by lectures, and by supplementary work, which includes the solution of many problems of the counting house; the daily use of suitable English; business correspondence; the discussion of commercial law; and some of the simpler features of political

economy,—production, consumption, distribution (of profits), and exchange.

Bookkeeping 1

The fundamentals are here presented. The "searchlight of Practice illuminates the dark places of Theory." The laws of debit and credit are developed in simple transactions. Business papers, vouchers, various rulings, journalizing, posting, inventories, trial balances, balance sheets, and statements, and closing the ledger are thoroughly mastered. As satisfactory advance is made, the sales book, cash book, special column journals, invoice book, etc., are introduced.

As ability is shown in their mastery, special columns and other new features are added. Throughout this course the student is caused to brief and file carefully all papers received, bills, orders, receipts, notes, checks, drafts, etc., after the entries have been made from them.

First Year, Scientific Preparatory Course. First semester, one lecture period and nine laboratory hours per week.

Bookkeeping 2

This course is a continuation of Course 1. Partnerships are formed, retail departments and a branch store are opened. Interest and capital accounts are adjusted; detailed statements of assets and liabilities, losses and gains rendered, is used for a time. The technical practice of shipping and commission, manufacturing, banking, corporations, and wholesale accounting is exhibited with modern, standard methods.

Toward the end of the year a business community is usually formed to which the trained bookkeepers are admitted, and as proprietors, transact business face to face. This is the nearest approach to real business experience that can be devised for the laboratory.

First Year, Scientific Preparatory Course. Second semester, one lecture period and nine laboratory hours per week.

Method: Sadler-Rowe Budget System; Powers & Lyon's Wholesale Accounting; International Business Practice.

Preparatory Science 2

MR. HUMBERT.

Biology: The aim of this course is to acquaint the student with the fundamental characteristics of living matter and vital energy, and induct him into the study of living things, in much the same way that elementary physics and chemistry lead to the study of lifeless things. The work during the first semester will be presented by lectures, recitations, laboratory and field work, and be summarized by quizzes. It includes the consideration of such topics as protoplasm, cells, tissues, organs, organisms, metabolism, growth, reproduction, etc., and the discussion of such subjects as comparison of animal and plant cells; comparison of ova of animals and plants; biogenesis and abiogenesis; homogenesis and heterogenesis; spermatogenesis and oogenesis; species and their origin; the distinctive characteristics of the higher animals and plants, etc.

In the laboratory available specimens, such as the following, will be systematically observed as time and circumstances will admit: Amoeba; haematococcus; euglena; yeast-plant; bacteria; mucor; penicillium; earthworm; crayfish; grasshopper; common brake (fern); fresh-water mussel; seeds and seedlings; flowering plants; frog and metamorphosis, etc.

The laboratory is well equipped with work tables, compound micrscopes, and such apparatus as is necessary to observe and study satisfactorily the above specimens.

Second Year, Scientific Preparatory Course. First semester, three lecture periods and six laboratory hours per week.

Reference texts: Parker's Elementary Biology; Sedgwick & Wilson's General Biology; Jordan & Kellogg's General Biology; Gage's The Microscope.

Preparatory Science 3

PROFESSOR O'HARRA.

Physical Geography: The work in physical geography is intended to give careful consideration to such fundamental physiographic principles as may be readily grasped by younger students. Especial attention is given to the composition and degeneration of rocks; the life history of rivers, lakes, plains and mountains; life on the land and in the sea; and man's relation to his physiographic conditions. Occasional excursions are taken to nearby places of interest.

Second Year, Scientific Preparatory Course.

Second semester, three lecture periods and three laboratory hours per week.

Text books: Gilbert & Brigham's Introduction to Physical Geography.

(Note: For Elementary Physics and Elementary Chemistry, see Pages 83 and 73).

DEPARTMENT OF HISTORY

MISS WOODS.

History 1

History of England: This course is a general survey of the leading facts in the history of England from the coming of the Saxons to the reign of Edward the VII. Adequate attention is given to geography and its influence upon events and conditions. Outline maps are required. Social and industrial developments, as the cause or result of political changes, are dwelt upon. As far as time permits, the periods of literary efflorescence are noted, characterized, and illustrated, as related to the prevailing spirit of the time. The collateral reading required is not extensive. However, in addition to the text book, copies of Guest's Hand Book of English History, Green's Short History of the English People, and Montgomery's Leading Facts of English History, are in the hands of each member of the class. Frequently a lesson is assigned in any one of them. That the student may be introduced to other authorities on the subject, short papers and reports, which demand investigation in the general library, are required.

First Year, College Preparatory Course. Three lecture periods per week throughout the year.

Text book: Cheyney's Short History of England.

History 2

Ancient History: This course aims to acquaint the student with the outline essential facts, from ancient Egyptian and Chaldean history to the revival of the Roman Empire under Charlemagne. Its object is to present the development of moral, political and social conceptions in such a way that the student will be fitted to appreciate the elements that make up modern civilization. By a small amount of source work, and frequent comment on the modern authors quoted in the text, there is an endeavor to give the student some idea of how history is made and the comparative value of different authorities. The collateral reading required is not extensive, but by careful selection is designed to introduce the student to the best authorities and make them appeal to him as desirable reading matter.

A note book containing references, class summaries and outlines is required. A thorough knowledge of the location of places and geographic influences is insisted upon. By a copious supply of photographs and talks, the place of Greece and Rome in sculpture and architecture is impressed upon the class.

First Year, Scientific Preparatory Course.

Second Year, College Preparatory Course.

Five lecture periods per week throughout the year.

Text book: West's Ancient History; Fling's European History Studies.

DEPARTMENT OF LANGUAGES

GERMAN

MR. STEVENS.

Great importance should be attached to the study of German, not only for its disciplinary value, but for its rich stores of scientific, technical, and literary thought. The work is arranged in two distinct lines; one for college preparatory students, and one for scientific students. The ability to read the language with accuracy in either case is aimed at. The work in the class room involves thorough drill in pronunciation; translation from the German into the English; and English into German; and a systematic study of the structure and idiom of the language. Classes are conducted, for the most part, in German, thus employing conversation as a means, not as an end. Required work continues through two years.

German 1

Elementary German: The aim of the first half year is to enable the student to read with expression simple German prose, and to accustom his ear to short German sentences. The last half year is spent in reading Storm's Immensee; Heyse's L'Arrabbiata, or equivalents, and in a continuation of the study of the grammar.

Second Year, Scientific Preparatory Course.

Third Year, College Preparatory Course.

Five lecture periods per week throughout the year.

Text books: Mueller & Wenkebach's Glueck Auf; Joynes-Meissner's Grammar.

German 2

This course is a continuation of German 1. Grammar is reviewed; the reading gradually becomes more difficult, and the syntax, idioms, and synonyms of the language are carefully studied. The reading in this course consists of selected works.

Third Year, Scientific Preparatory Course.
Fourth Year, College Preparatory Course.
Four lecture periods per week throughout the year.

Reference book: Whitney's Compendious German Grammar.

German 3

This course is an equivalent of German 2 and is alternated with it. The aim is to afford preparatory students an opportunity for more extensive reading, required by certain colleges. It comprises the reading of selected works of Goethe, Schiller, and Lessing; advanced study of grammar and composition work.

German 4

Scientific German: This course may be substituted, at the discretion of the instructor, for the second semester of German 2. The reading is

accompanied by grammar and language work, as in German 2.

Text book, Dippold's Scientific Reader.

LATIN

MR. STEVENS.

It is the purpose of the instruction in Latin to aid in securing a knowledge of the structure of the language, an acquaintance with the literature and social and political institutions of the Roman people, and to discipline the mind in accuracy and thoroughness. By repeated drills in quantities and pronunciation, the student is trained in close observation. He is required to learn accurately, and to memorize discriminately, the various forms. Exercises in Latin composition are required in all courses. The habits, customs, and institutions of the Roman people are studied in student papers and discussions. Every effort is made to lead the student into a sympathetic contact with Roman life, to obliterate time and space, and to speak first hand with these authors and their people.

Latin 1

First lessons and grammar; drills in quantities, pronunciation (Roman), etymology, and syntax.

First Year, College Preparatory Course. Five lecture periods per week throughout the year.

Text books: Allan & Greenough's Latin Grammar; Pearson's First Lessons.

Latin 2

Caesar's Gallic Wars (books one to six in-

clusive). Prose composition throughout the year, one hour per week.

Second Year, College Preparatory Course. Five lecture periods per week throughout the year.

Text book: Allan & Greenough's Caesar; Pearson's Latin Composition.

Latin 3

Cicero. Seven selected orations; prose composition; a study of Cicero's time.

Third Year, College Preparatory Course. Five lecture periods per week throughout the year.

Text book: Cicero's Orations (Allan & Greenough); Pearson's Latin Composition.

Latin 4

Vergil: Books one to six inclusive; prosody; mythology; prose composition.

Fourth Year, College Preparatory Course. Five lecture periods per week throughout the year.

Text book: Greenough & Kittredge's Vergil; Latin Composition.

LIST OF STUDENTS DURING THE SCHOOL YEAR 1905-1906

Anderson, Amil.....Rapid City, South Dakota
Anderson, Archie.....Rapid City, South Dakota
Anderson, Edward.....Rapid City, South Dakota
Anderson, Frank.....Rapid City, South Dakota
Anderson, Victor.....Rapid City, South Dakota
Arpeno, Louis.....Greenmont, South Dakota
Ballard, Peter A.....Miller, South Dakota
Bangs, Eva.....Rapid City, South Dakota
Barnett, Otto.....Belle Fourche, South Dakota
Barstow, Welch.....Rapid City, South Dakota
Bennett, R. T.....Pierre, South Dakota
Berry, Sarah.....Rapid City, South Dakota
Betterton, Jesse.....Columbus, Nebraska
Betts, C. W.....Mitchell, South Dakota
Boylan, Madge.....Piedmont, South Dakota
Bower, Laura.....Rapid City, South Dakota
Brockett, Fred.....Rapid City, South Dakota
Brooks, Floyd.....Rapid City, South Dakota
Brown, Helen.....Rapid City, South Dakota
Bryant, Frank.....Spearfish, South Dakota
Burton, Burt.....Elm Springs, South Dakota
Cabot, Charles H.....Rapid City, South Dakota
Carr, Bernard.....Weiser, Idaho
Chase, Nellie.....Rapid City, South Dakota
Clemens, Beatrice.....Rapid City, South Dakota
Collins, Beulah.....Rapid City, South Dakota
Cooledge, Cyril.....DeSmet, South Dakota
Coolidge, Edwin.....Omaha, Nebraska
Coolidge, Roy.....Omaha, Nebraska
Cornell, Wharton.....Wilmington, Delaware
Cox, Minnie.....Rochford, South Dakota
Cox, Ralph.....Rochford, South Dakota
Crockett, Morton.....Rapid City, South Dakota
Curran, Harry T.....Aberdeen, South Dakota
Daly, Doris.....Rapid City, South Dakota
Damon, Claude E.....Lead, South Dakota
Driesbach, R. H.....Redfield, South Dakota
Eddy, John W., Jr.....Helena, Montana
Ellerman, Otto.....Yankton, South Dakota

Elliott, J. W.....Columbus, Nebraska
Evans, Edward L.....Newcastle, Wyoming
Fahrenwald, Frank A.....Rapid City, South Dakota
Ferguson, Callie.....Rapid City, South Dakota
Ferguson, Nina.....Rapid City, South Dakota
Gaines, William, Jr.....Northfield, Minnesota
Gantz, Saxe P.....Rapid City, South Dakota
Good, Ralph.....Chadron, Nebraska
Goodner, Ivan E.....Rapid City, South Dakota
Grant, Dick.....Sioux Falls, South Dakota
Gray, Clarence.....Rapid City, South Dakota
Gray, Nellie.....Rapid City, South Dakota
Halley, Frances.....Rapid City, South Dakota
Ham, Arthur.....Rapid City, South Dakota
Harris, Imogene.....Rapid City, South Dakota
Hartgering, Genevieve.....Rapid City, South Dakota
Hartgering, James F.....Rapid City, South Dakota
Hartgering, McRae.....Rapid City, South Dakota
Harvey, Eldon.....Rapid City, South Dakota
Harvey, Florence.....Rapid City, South Dakota
Hebblethwaite, Leon L.....Evanston, Illinois
Hibbard, Newell.....Nahant, South Dakota
Hogarth, John R.....Deadwood, South Dakota
Holly, Jerry.....Rapid City, South Dakota
Homer, Dudley D.....Somerville, Connecticut
Hunter, George R.....Deadwood, South Dakota
Hurlbut, R. C.....Rapid City, South Dakota
Hurlbut, Warren.....Rapid City, South Dakota
Hurzeler, Grace.....Rapid City, South Dakota
Ickes, E. L.....Deadwood, South Dakota
Ives, Glen P.....Alexandria, South Dakota
Katsch, Walter.....Fairburn, South Dakota
Keliher, Linnie.....Rapid City, South Dakota
Keliher, Marguerite.....Rapid City, South Dakota
Keliher, Miriam.....Rapid City, South Dakota
Keliher, Maurice.....Rapid City, South Dakota
Kingsbury, Richard P.....Butte, Montana
Lamb, Roscoe.....Newcastle, Wyoming
Larson, Addora.....Rapid City, South Dakota
Lenhart, Charles.....Rapid City, South Dakota
Ledyard, L. W.....Sioux Falls, South Dakota
Lewis, Leora.....Rapid City, South Dakota

Lien, George.....Sioux Falls, South Dakota
Long, Leon R.....Amboy, Illinois
Louthan, Howard.....Littleton, Colorado
McCain, Will.....Rapid City, South Dakota
McCarthy, Grover C.....Rapid City, South Dakota
McMahon, Ralph.....Rapid City, South Dakota
Matson, Bernard V.....Deadwood, South Dakota
Matson, Leon L.....Deadwood, South Dakota
Marshall, Helen.....Rapid City, South Dakota
Mellinger, Lloyd.....Deadwood, South Dakota
Merritt, Mary.....Rapid City, South Dakota
Millard, B. E.....Lead, South Dakota
Morris, Julien.....Rapid City, South Dakota
Morris, Milton.....Rapid City, South Dakota
Mosier, Peter.....Rapid City, South Dakota
Nash, Claude.....Piedmont, South Dakota
Nelson, Ole.....Terry, South Dakota
Nyswanger, Lillian.....Rapid City, South Dakota
Oates, William.....Central City, South Dakota
O'Brien, B. D.....Lead, South Dakota
Olmstead, Lora.....Rapid City, South Dakota
Otis, Myrtle.....Farmingdale, South Dakota
Overpeck, Destie.....Rapid City, South Dakota
Overpeck, Lem.....Rapid City, South Dakota
Parker, Emma.....Rapid City, South Dakota
Parrish, Lena.....Mead, Nebraska
Patton, Maude.....Rapid City, South Dakota
Penhoel, Louis C.....St. Paul, Minnesota
Pinkerton, Robert S.....Rapid City, South Dakota
Pitts, Charles A.....Silver City, South Dakota
Plunkett, James J.....Central City, South Dakota
Porterfield, Bessie.....Rapid City, South Dakota
Post, Elizabeth.....Rapid City, South Dakota
Post, Mina L.....Rapid City, South Dakota
Quiggle, Alta.....Rapid City, South Dakota
Quong, Wong Hong.....Deadwood, South Dakota
Raymond, Anan.....Rapid City, South Dakota
Read, Herbert.....Rapid City, South Dakota
Read, J. Burns.....Rapid City, South Dakota
Reeves, Lu.....Lead, South Dakota
Richards, Willard.....Rapid City, South Dakota
Rose, Walter.....Pierre, South Dakota

Rutkowski, Alfred.....Rapid City, South Dakota
Sanders, Cora.....Rapid City, South Dakota
Sargent, Arthur.....Rapid City, South Dakota
Saville, Joseph.....Keystone, South Dakota
Schleuning, Emelie.....Rapid City, South Dakota
Schrader, Helen.....Rapid City, South Dakota
Schraps, Paul C.....St. Louis, Missouri
Schuster, Clara.....Rapid City, South Dakota
Seiter, Herbert.....Omaha, Nebraska
Shumate, Thomas.....Deadwood, South Dakota
Smith, Amos C.....Yankton, South Dakota
Smith, Anna.....Rapid City, South Dakota
Smith, Earl Van L.....Akron, Ohio
Smith, James.....Rapid City, South Dakota
Sparling, William G.....Hot Springs, South Dakota
Spayde, Arthur.....Rapid City, South Dakota
Spayde, Ethelwyn.....Rapid City, South Dakota
Stoner, J. W.....Lead, South Dakota
Thoma, Clara.....Rapid City, South Dakota
Thoma, Roy.....Rapid City, South Dakota
Turner, George E.....Hot Springs, South Dakota
Van Nuys, Claude E.....Flandreau, South Dakota
Wells, Leon P.....Aberdeen, South Dakota
Weston, Blanche.....Rapid City, South Dakota
Wetherald, Fred H.....Boston, Massachusetts
Wheelock, Harry.....Rapid City, South Dakota
Whitmore, Charles F.....Canton, South Dakota
Whytock, Peter.....Johannesburg, South Africa
Wiegand, Clara.....Rapid City, South Dakota
Williams, Clara.....Hayes, South Dakota
Winters, Frederick W.....Mazeppa, Minnesota
Wood, B. M.....Rapid City, South Dakota
Woodward, Don.....Albany, Indiana

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South Dakota State School of Mines

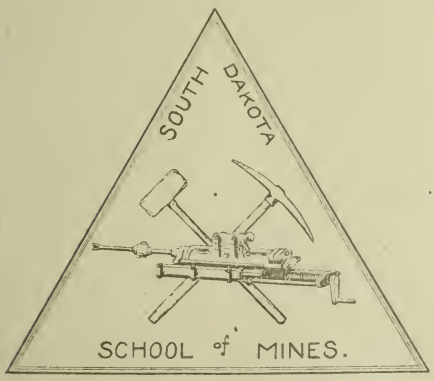
1907 1908

Rapid City, South Dakota

Annual Catalog

TELEGRAM PRINT, DEADWOOD

THE SOUTH DAKOTA STATE SCHOOL OF MINES



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1907

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OCTOBER

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NOVEMBER

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DECEMBER

S	M	T	W	T	F	S
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6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

COLLEGE CALENDAR

School year begins.....Wednesday, September 18, 1907

Entrance Examinations begin.....September 16, 1907

Registration Committee considers applications for Advanced Standing and Credentials for Admission without examinations.....September 17, 1907

Thanksgiving Day recess, November 28 to November 30. 1907

Christmas vacation....December 23, 1907, to January 4, 1908

Examination week..January 27 to January 31, 1908, inclusive

First Semester ends.....January 31, 1908

Second Semester begins.....February 3, 1908

Washington's Birthday Anniversary.....February 22, 1908

Spring Recess.....April 6 to 11, 1908

Memorial Day.....May 30, 1908

Examination Week.....May 25 to 30, 1908

Baccalaureate Sermon.....May 31, 1908

Granting of Diplomas in Preparatory Department.....June 2, 1908

Faculty and President's Reception.....June 3, 1908

Commencement and Conferring of Degrees.....June 4, 1908

Second Semester ends.....June 4, 1908

REGENTS OF EDUCATION

MEMBERS OF THE BOARD

A. W. BURTT, Huron, Term expires January 1, 1909

FREDERICK A. SPAFFORD, Flandreau.....
.....Term expires January 1, 1909

S. E. FORREST, Britton.....
.....Term expires January 1, 1911

E. C. ERICSON, Elk Point.....
.....Term expires January 1, 1913

A. J. NORBY, Sisseton.....
.....Term expires January 1, 1913

OFFICERS OF THE BOARD

E. C. ERICSON, President, Elk Point
IRWIN D. ALDRICH, Secretary, Big Stone
C. H. CASSILL, (State Treasurer)
Treasurer Ex-Officio

REGENT'S COMMITTEE IN CHARGE OF THE SCHOOL OF MINES

A. J. NORBY A. W. BURTT

FACULTY

CHARLES HERMAN FULTON, President and Professor of Metallurgy.
E. M., Columbia University.

CLEOPHAS CISNEY O'HARRA, Professor of Mineralogy and Geology.
A. B. Carthage College. Ph. D. Johns Hopkins University

HOWARD LINCOLN MCLAURY, Professor of Mathematics.
A. B. Oberlin College. A. M. Harvard University.

MARK EHLE, JR., Professor of Mining.
E. M. Colorado School of Mines.

MELVILLE FULLER COOLBAUGH, Professor of Chemistry.
B. S. Colorado College. A. M. Columbia University.

JOHN MCLEARIE, Professor of English.
A. B. Macalester College. A. M. University of Chicago.

BARRINGTON D. O'BRIEN, Professor of Engineering.
B. S. South Dakota School of Mines.
E. E. Rose Polytechnic.

CLARENCE LESLIE LEWIS, Lecturer on Mining Law.
University of Michigan.

ADELBERT DALE HUMBERT, Instructor in Mathematics and Preparatory Science.
Cornell College.

STEIN BANGS, Instructor in Physics.
Purdue University.

ELBERT MARCUS STEVENS, Principal of Preparatory Department and Instructor in Modern Languages.
A. B. University of South Dakota. A. M. Yale University.

KATHERINE KILLEEN, Instructor in History.
A. B. University of Michigan.

DELLA MAY HAFT, Librarian.
Ph. B. University of Chicago.

ETHEL SPAYDE, Registrar.

LLOYD MELLINGER, Assistant in Chemistry.

FRANK BRYANT, Assistant in Assaying.

JESSE OATMAN BETTERTON, Assistant in Chemistry.

CLAUDE CORNELIUS VAN NUYS, Assistant in Metallurgy.
B. S. Yankton College.

OTHER EMPLOYES

WILLIAM A. COURSEN, Chief Janitor and Engineer.

GEORGE A. HOWELL, Janitor.

ANDREW WALLEEN, Fireman.

STANDING COMMITTEES OF THE FACULTY

Committee on Admission and Registration:

PROFESSOR MCLAURY
PROFESSOR EHLE
PROFESSOR COOLBAUGH
MR. HUMBERT
MR. STEVENS

Committee on Emergencies and Discipline:

PROFESSOR O'HARRA
PROFESSOR MCLEARIE
PROFESSOR EHLE
PROFESSOR MCLAURY

Committee on Course of Study:

PROFESSOR EHLE
PROFESSOR O'HARRA
MR. STEVENS
MR. BANGS

Committee on Catalog and Publications:

MR. HUMBERT
MR. BANGS
MR. O'BRIEN
PROFESSOR MCLAURY

Committee on Library:

MISS HAFT
MISS KILLEEN
PROFESSOR COOLBAUGH

Committee on Athletics:

PROFESSOR MCLEARIE
PROFESSOR O'HARRA
MR. STEVENS

Committee on Student Organization:

PROFESSOR MCLEARIE
PROFESSOR MCLAURY
MISS KILLEEN
PROFESSOR COOLBAUGH

The regular meeting of the faculty is held on the first Monday of each month.

GENERAL STATEMENT

ESTABLISHMENT OF THE SCHOOL, ETC.

The School of Mines is a state educational institution, and is at present almost wholly maintained by appropriations of the State Legislature. It is endowed with 40,000 acres of land, lying in the State of South Dakota, and a grant from the federal government. It receives a comparatively small income from the rental of these lands, which are, however, steadily increasing in value. The school is under the control of the Regents of Education. The regents, five in number, are appointed by the governor, confirmed by the senate, and have control of the various public institutions of learning maintained wholly, or in part, by the State as State Institutions.

The following is an extract from the act of the legislature, establishing the School of Mines:

Section 1. (School of Mines Established.) That a School of Mines for the Territory of Dakota be established at Rapid City, in Pennington County, Dakota Territory. It shall be the object of such School of Mines to furnish facilities for the education of such persons as may desire special instruction in Chemistry, Metallurgy, Mineralogy, Geology, Mining, Milling, Engineering, Mathematics. Mechanics, Drawing, the Fundamental Laws of the United States, and the Rights and Duties of Citizens.

Approved March 7, 1885.

HISTORY AND AIM OF THE SCHOOL

The chief aim of the State School of Mines is to offer young men a thorough education in mining and metallurgical engineering, believing that thereby the exploitation of the mineral resources of the State will be aided. Whenever it is possible, the School

also aids the development of the mineral resources by the investigation of mining and metallurgical problems which arise in the district. At the present time, many graduates of the School are employed in responsible positions in the Black Hills and throughout the West generally, and are doing much toward the developing of the State's mineral wealth. It is well known that the successful exploitation of the Cambrian ores of the Black Hills was due in a large measure to the experiments performed at the State School of Mines. This refers particularly to the chlorination process and to sulphide smelting. The School issues, from time to time, bulletins treating of Black Hills economic geology, and of mining and metallurgical methods, which can be obtained by those interested, upon request.

The first building of the School was erected in 1885, and is a three-story brick structure in which were originally chemical and assay laboratories, and class rooms. The staff of instructors was necessarily small and the course by no means complete. The School, however, under able management, steadily though slowly gained in reputation, and, in 1887, erected a second building to serve the purpose of a metallurgical laboratory. This building is 138 by 60 feet in size, and was fitted with metallurgical and mining experimental machinery. In 1901 what is now the Main Building of the School was erected, the legislature appropriating $20,000 for that purpose. In 1903 another $20,000 was appropriated by the legislature for an addition to the Main Building, and $5,000 was appropriated for the construction of a separate heating plant. In 1905 $8,000 was appropriated for the improvement of the metallurgical laboratory and extension of the heating plant, etc.

The number of buildings and equipment, at the present time, is such as to give good facilities for thorough instruction in mining and metallurgy.

LOCATION

The School of Mines is located in Rapid City, in the foot hills of the Black Hills of South Dakota. Rapid City is on the Chicago & Northwestern Railway, on that branch extending from Omaha to Deadwood and Lead, South Dakota. Within the year, Rapid City will also have direct connection with the eastern part of the state, by means of a branch of the same railroad now under construction from Pierre to Rapid City; and also by the Chicago, Milwaukee & St. Paul Railway now under construction from Chamberlain, South Dakota, to Rapid City. It has also connection with the Burlington system by means of the Missouri River & Northwestern Railway from Rapid City to Mystic.

Rapid City is a growing town of about 3,200 inhabitants. It was founded in 1876 and is the most beautifully located town in the Black Hills. It is situated on Rapid Creek, and a half hour's walk takes one either out on the plains or into the hills. It has large stores of all kinds, and living is comparatively cheap for a western town. It offers many advantages as a college and residence city. It has seven churches, representing practically all the principal denominations. There are costly water works fed by springs, four miles back in the hills; also a modern illuminating gas works and an electric lighting plant, furnishing the city with light.

The elevation of the city is 3,200 feet above sea level and the climate is a very healthful one, the

winters being usually mild and the summers cool. The climate is dry, the average rainfall being about 20 inches.

There is much social life in the town, and students, after becoming acquainted, may enjoy the influences of home life. The students of the School find board and lodging in the homes, as the School does not maintain a dormitory.

The distance to Deadwood is only 46 miles and but a little more into the heart of the great producing mining section of the Hills. The mining districts of Keystone, etc., are within 25 miles of Rapid City. It was thought derisable to locate the School at some distance from the active mining region, rather than directly within it, for it is now realized in technical education that the teaching of the fundamental sciences must be thoroughly accomplished before their technical application can be considered. If the School were located directly within the bustle of the mines and mills, it is very probable that, to some extent, the extremely practical surroundings might interfere with the proper methods of study of the preliminaries.

In the last two years of the course, many visits are made to the active mining districts for the purpose of a close study of the methods in vogue. It is the intention, within the next year or so, to establish a summer school of mining to last six to eight weeks, in order to give the student a still more practical acquaintance with mining and metallurgical methods.

The location of the School is very favorable for the study of Geology. The Black Hills have long been known to afford remarkable facilities for the field

study of Geology, in that the rocks of practically all ages are exposed in the uplift of the Black Hills. The great eruptive districts of the northern Hills afford fine opportunities for this branch of Geologic study.

Close to the School, within a few hundred yards, is the pyritic smelting plant of the Standard Smelting Company, which treats the ores from the surrounding districts. It smelts ores, collecting the values into a matte which is shipped to other plants for refining. This plant affords the more advanced students in Metallurgy every facility for an intimate study of a very interesting process. The management of the plant extends every courtesy to the students of the School of Mines.

BUILDINGS AND EQUIPMENT

Buildings and Grounds

The buildings in which the work of the School is carried on are three in number: First, the original School of Mines building, a commodious brick structure, three stories in height, situated in the west part of the grounds, and at the present time devoted entirely to the Preparatory Department, in which students, found deficient in studies for entrance into the School of Mines, are properly prepared. It contains a large assembly room and class rooms for the study of languages, mathematics, history, and a laboratory for biology. It is heated throughout by steam, furnished from the central power plant, and is lighted by electricity.

In the center of the grounds is the main building of the School, a large brick structure, with native sandstone trimmings, three stories in height, built in two wings in the shape of a T. This build-

ing contains in the front wing, on the first floor, a large entrance hall, a Geological Museum, class rooms in Mathematics and English, the President's and the Register's offices. On the second floor are chemical laboratories, comprising the general, qualitive and quantitive laboratories, and offices and class rooms of the Department of Chemistry. The basement of the building contains the physical laboratory, store rooms, lunch room, and the lighting plant. The first floor of the rear wing of the main building contains the Library and the balance of the Department of Geology and Mineralogy, consisting of class rooms and offices, and a thoroughly equipped mineralogical laboratory. The second floor contains the Department of Engineering, consisting of instructors' offices, two large drawing rooms for the Freshmen and Sophomore classes respectively, a large lecture room, and a thoroughly equipped room for making blue prints. In the basement of this wing is a well equipped machine shop and store rooms. The machine shop serves the purpose of enabling the School to make a very appreciable amount of apparatus for scientific work as the occasion for its construction arises.

East of the Main Building is the Metallurgical Laboratory Building, 138 feet by 60 feet in plan, two stories in height, built of red brick with stone trimmings. This building is devoted exclusively to the Department of Mining and Metallurgy. It contains, on the first floor, a large chemical laboratory for advanced metallurgical chemistry, a well equipped balance room, containing massive concrete piers for the mounting of balances, private chamical laboratory and supply room, assay laboratory and a large assay furnace room. In the rear of the assay furnace room

is the metallurgical laboratory, containing mining and metallurgical machinery and apparatus.

On the second floor are located the lecture rooms of the Departments of Mining and of Metallurgy, offices of these departments, and a Mining and Metallurgical Museum.

On the east part of the school grounds is located the central heating plant, containing boilers, etc., which supply the three large buildings mentioned with heat, and the metallurgical laboratory with power. It is built of stone and has adjoining sheds with a large capacity for the storage of coal. Owing to the scarcity of water until comparatively recently, the grounds of the School, comprising eleven acres, do not present as attractive an appearance as might be. Strong efforts are now being made to beautify the grounds.

Equipment

In general, the School is well equipped to carry on its work. It has that essential of modern scientific technical instruction, ample laboratory facilities in all required branches.

Library

The libraries of the South Dakota State School of Mines are made up of a general library and the departmental libraries in Metallurgy, Mining, Geology, Chemistry, Engineering, Physics, English and History.

The general library and reading room occupy a large, well lighted and well equipped room on the first floor of the annex of the Main Building. Here are kept the reference books and others of a general nature, not bearing directly upon the work of any particular department.

Economics, History, Philosophy, Agriculture and Literature are represented.

In this room is also placed a library of 400 volumes of a miscellaneous nature which the Rapid City Library Association loans the School.

On the reading tables are found the best journals on Mining, Metallurgy, Geology, Chemistry and Engineering, as well as magazines of a more general interest.

The following journals are on file:

Mining and Scientific Press.
Engineering and Mining Journal.
Mines and Minerals.
Mining Reporter.
Mining Magazine.
Bulletins, American Institute of Mining Engineers.
Bulletins, Institution of Mining and Metallurgy.
Journal, Chemical, Metallurgical and Mining Society of South Africa.
Metallurgie.
Berg and Huetten-mannische Zeitung.
Economic Geology.
Bulletins, Geological Society of America.
Journal of Geology.
Engineering Magazine.
Journal, American Chemical Society.
American Chemical Journal.
Journal of the Society of Chemical Industry.
Electro-Chemical and Metallurgical Industry.
Mining World.
National Geographical Magazine.
Engineering News, and others of a similar bearing.
Leading daily papers.

Exchanges received from student publications.
Industrial World.

The reference works contain, among others, complete or partial sets of bound volumes of the following publications:

Transactions American Institute of Mining Engineers.

Transactions Institution of Mining and Metallurgy.

Engineering and Mining Journal.

Mining Reporter.

Bulletins, Geological Society of America.

Journal, Chemical, Metallurgical and Mining Society of South Africa.

Journal of Geology.

American Geologist.

The Mineral Industry.

Bulletins of U. S. G. Survey and others.

The departmental libraries contain all of the chief books bearing directly upon the work of the respective departments. They are, for the most part, readily accessible to the student. The card system of cataloguing is in use.

Drawing Rooms

In the Department of Engineering are two large drawing rooms—one for Freshmen and Sophomore work, the other for Junior work.

The rooms are fitted with especially designed drawing desks, each desk containing lockers in which students take care of their supplies. The drawing rooms are well lighted by many windows. Adjoining the Freshman drawing room is a large room for the making of blue prints. It contains the blue print machine, sliding on a frame in the window, with south

exposure so that sunlight is available for the greater part of the day. A large sink for the washing of prints is provided.

Chemical Laboratories

There are three chemical laboratories—one for general chemistry, one for qualitative analysis, and one for quantitative analysis. The last two laboratories are equipped with large individual desks with tile tops, each desk being supplied with gas from the city mains. Between the desks are sinks with flowing water. Each student receives a separate and complete set of reagent bottles and supplies. The laboratories are well lighted and provided with ample hoods to carry off the fumes. The quantitative laboratory is equipped with a separate balance room in which are analytic balances of standard makes, among them Becker's and Troemner's.

The apparatus is ample for all mineral, alloy and rock analysis, and includes combustion furnaces, apparatus for gas analysis, and all facilities for electrolytic precipitations.

Physical Laboratory

The Physical Laboratory is located in the basement of the annex of the Main Building, thus securing absolutely stable foundations for such apparatus and instruments as require it.

The laboratory is thoroughly equipped with the ordinary physical apparatus, such as balances, Atwood machine, hydrometers, specific gravity apparatus, spectroscopes, apparatus for the measurement of light, calorimeters, electrical apparatus, such as the Wheatstone bridge, voltmeters, ammeters, galvanometers, engine indicators, etc.

For electrical experimentation, dynamo and motors are available.

Assay Laboratory

The Assay Laboratory is very modern in its appointments. It has, within the last year, been completely remodeled. It contains a room in which the students are provided with individual desks; pulp balances for the mixing of assay charges; a balance room provided with concrete foundation piers; the pulp room in which ore samples, etc., are crushed and sampled, and the furnace room in which furnace work is done exclusively. This furnace room contains five double muffle-furnaces, heated by soft coal. These furnaces were specially furnished by the Denver Fire-Clay Company, Denver, Colorado.

They are placed in openings in a heavy dividing wall, separating the machinery hall from the front part of the building. In this way the front of the furnaces with the muffle openings are in the furnace room, flush with the wall, while the firing and taking out of ashes is done on the other side of the wall, thus avoiding the dust and dirt where it is very undesirable. The furnace room is fire-proof. There is a melting furnace using coke; also gasoline furnaces, made by Braun & Company, San Francisco.

The balance room is provided with Ainsworth, Eimer & Amend, and Thompson balances. In the pulp room, a water motor furnishes power for the small Gates sample crusher and a sample grinder. A Calkins automatic cupel machine is used for the making of cupels. A large number of ore samples are kept on hand. Ores from all parts of this country are provided in great variety. The nearness of a smelter and mills makes it comparatively easy to

procure many types of furnace products, such as mattes, flue dust, fume and umpire samples for close checking work.

Metallurgical Laboratory

The metallurgical laboratory contains machinery and apparatus, mainly illustrative of that used in the metallurgy of lead and copper, gold and silver. There is a 30-inch water-jacketed furnace, a small Bruckner roasting furnace, a Baker blower, a Dodge crusher, two sets of rolls, a dry crushing stamp battery, a wet crushing stamp battery equipped with automatic feeds, amalgamated copper tables, a Frue vanner table, two amalgamating pans for silver ores, one settling pan, sizing screens, hydraulic classifiers, jigs, and a cyanide leaching plant. Part of this machinery is at present not in use, as it will be re-set and added to within a short time. Most of it is used frequently in the work of the laboratory. Steam is furnished by the central power plant for the 40-horse power Corliss mill engine.

Scientific metallurgical apparatus, consisting of metallographic microscopes, pyrometers, electric resistance furnace, apparatus for gas analysis, etc., are available for frequent use. This portion of the equipment is rapidly being added to. A special laboratory is provided in the Metallurgical Building, devoted to metallurgic analysis and research. Students carrying on thesis work in metallurgy have desks in this laboratory.

Mineralogical Laboratory

This is a large room well equipped with low tables arranged for the study and determination of minerals. Students are provided with the neces-

sary reagents and apparatus by the department, upon the payment of a small fee. Each student has his own locker. A large working collection of carefully labeled minerals available for student use is kept in specially designed cases ready of access, and a considerable collection of unknown minerals is at hand for determination.

Geological Museum

The museum is an important feature in the equipment of the School of Mines. Its contents have been chosen to assist in the teaching of geology, mineralogy, petrography and paleontology, rather than to become a store house of curiosities. The room is thirty-six by forty-seven feet in size and lighted by ten large windows.

Two kinds of cases are used for the display of specimens—central cases and wall cases. There are eight central cases, each consisting of two parts of three compartments each, with glazed tops, and a six compartment massive base; the whole constructed in such manner as to serve practically as two sections, fitting tightly, back to back. The display surface, under glass, is nearly fifty feet square for each case. The bases are especially designed for the storage of material not needed for constant exhibition. The cases are of oak.

The wall cases are finished in pine and have glazed doors. Each is seven feet six inches high and contains three double-doored compartments of six shelves. The cases are particularly adapted for the display of large specimens.

Cases one and two contain a general collection of minerals arranged according to Dana's system of classification. Cases three and four contain series of

specimens to illustrate general features of mineralogy, geology and petrography. Case five contains a collection of well preserved fossils, carefully selected to show the more prominent features of paleontological interest. Case six contains representative collections of Black Hills ores and rocks. Case seven contains Cretaceous and Tertiary fossils from the Black Hills region, mainly from the Cheyenne river and the White river Bad Lands. Case eight contains a good collection of Black Hills minerals.

The wall cases are for large specimens of all classes, some of which are very beautiful. The collection from the Black Hills is especially noteworthy and is very rich in the rare minerals of the region, as for instance, lepidolite, wolframite, columbite, amblybonite, etc.

The museum contains two large topographic maps of the Black Hills made for the St. Louis Exposition and kindly loaned for the present, by Mr. E. E. Howell, through the kindness of Mr. S. W. Russell.

The museum has also recently been enricred by the gift of a very valuable and unique rock section of the Homestake Mine, donated by the Homestake Mining Company of Lead, South Dakota.

The collection of minerals exhibited by the School at the St Louis Exposition, 1904, received a diploma and gold medal.

Mining and Metallurgical Museum

This is, as yet, in its infancy. It is situated on the second floor of the Metallurgical Building, in a large, well lighted room and contains wall cases for the display of specimens. It has a fair collection of furnace products, such as slags, mattes, etc., wall boards

of hoisting ropes and screens, and similar material. In time it will become a valuable adjunct to the teaching of mining and metallurgical subjects. It is constantly being added to by the kindness of the manufacturers and mining companies, who donate exhibits. The School is always very grateful for donations of this kind and makes due acknowledgment for the same.

Shops

In the basement of the Main Building a large workshop is provided, containing a machine lathe, planers, drill press, other machinery, and many tools. Occasion often arises for the design and construction of certain pieces of apparatus for different departments, especially those of Metallurgy, Mining, Physics, and Chemistry.

Many pieces of apparatus have been constructed in this shop which would have cost the School considerable sums of money. The students of the upper classes are granted permission to use the facilities offered by the shop, whenever occasion arises to do so, in their work.

PUBLICATIONS

Bulletin No. 1.—Preliminary Report of the Dakota School of Mines upon the Geology, Mineral Resources and Mills of the Black Hills of Dakota; 171 pages. 1888 (Out of print.)

By F. R. Carpenter and H. O. Hofman.

Bulletin No. 2.—Notes on the Geology and Mineral Deposits of a Portion of the Southern Black Hills; 41 pages, Department of Geology. 1899.

By C. C. O'Harra and A. Forsyth.

Bulletin No. 3.—Cyanide Experiments on the Silicious Ores of the Northern Black Hills, etc.; 27 pages; Department of Metallurgy. 1900.

By A. Forsyth and G. H. Clevenger.

Bulletin No. 4.—History of the Early Explorations, etc., in the Black Hills, and Bibliography of Contributions to the Geology of the Black Hills Region; 88 pages; Department of Geology. 1900.

By C. C. O'Harra.

Bulletin No. 5.—The Cyanide Process in the Black Hills of South Dakota; 88 pages; Department of Metallurgy. 1902.

By C. H. Fulton.

Bulletin No. 6.—The Mineral Wealth of the Black Hills; 88 pages; Department of Geology. 1902.

By C. C. O'Harra.

Bulletin No. 7.—Metallurgical Practice in the Black Hills of South Dakota; 63 pages; Department of Metallurgy. 1904.

By C. H. Fulton.

Bulletin No. 8.—The Cement Resources of the Black Hills. (In press.)

Bulletin No. 9.—Annual Catalog: Descriptive of the Courses Given by the School, and Containing General Information.

Bulletin No. 10.—Announcements containing information about the School, issued regularly.

Bulletin No. 11.—The Aurum, published monthly, nine times per year, by the Students' Association of the State School of Mines. Subscription, $1.00 per year. The Aurum contains besides school news technical articles of interest and value.

The publications of the School may be had, free of charge, by addressing the President.

STUDENTS' EXPENSES

Tuition

The tuition and incidental fee is $6 per semester or $12 per year, payable in advance on registration. This fee is the same to residents and to non-residents of the state.

According to Section 209 of the Political Code, 1903, page 40:

"The regents shall fix all rates of tuition and other fees, to be paid by students, but such rates shall be the same in all the different institutions. They may receive, in any one of the institutions under their control, free of tuition, two students, appointed by each State Senator, and one by each Representative of the State Legislature, which appointees shall be residents of their respective districts or counties, and whose term shall expire with the term of office of said Senator or Representative; provided that such appointees shall comply with all the rules and requirements of the institution which they desire to enter. No student, however, shall receive any other gratuity whatever.

Fees

Fees enumerated below cover the bare cost of materials and supplies consumed in the laboratories and loss due to breakage, etc.

All fees are payable at the beginning of each semester, on registration. (Consult Departments of Instruction for description of courses.)

Chemistry 1, Elementary Chemistry	$ 4	per semester
Chemistry 6, Qualitative Analysis	7	per semester
Chemistry 7, Quantitative "	8	per semester

Chemistry 8, Metallurgical Analyses	8	per semester
Metallurgy 6, Assaying	25	
Metallurgy 7, Metallurgical Laboratory	5	per semester
Metallurgy 8, Metallurgical Laboratory	5	per semester
Mineralogy 1, General Mineralogy	5	per semester
Mineralogy 2, Blow-pipe Analysis	5	per semester
Geology 3, Petrography	2	per semester
Physics 2, Elementary Physics	1	per semester
Physics 4, Advanced Physics	2	per semester
Engineering 7, Surveying	3	per semester
Engineering 3, Mechanical Drawing	1	per year
Engineering 5, Mechanical Drawing	1	per year
Preparatory Science, Biology	2	per semester
Chemistry 1, 6, 7 and 8 deposit to cover breakage, etc	5	
Metallurgy 6, deposit to cover breakage	3	
Fee for bachelor's degree	5	
Fee for advanced degree	10	

(Note—No platinum is furnished by the Department of Chemistry.)

Other Expenses of the Nature of Fees

The Department of Engineering furnishes supplies for the mechanical drawing courses, practically at cost.

Engineering 1, Mechanical Drawing, will cost approximately, $7 for the year, exclusive of drawing instruments, which the student purchases on his own account, prices ranging from $13 up for a good set of instruments.

Engineering 3, Mechanical Drawing, will cost approximately $4 for the year.

Engineering 5, Mechanical Drawing, will cost $2.50 for the year.

Living Expenses

Board and room may be obtained in town with private families or in boarding houses or hotels, at rates varying from $20 to $30 per month, according to accommodation; $25 per month is a fair average and will insure good board and room. Rooms only may be obtained for from $5 to $10 per month, and table board for from $4 upward, per week. This makes the expense for board and room for the school year of 37 weeks range from $185 to $275, according to location and accommodation.

Expenses for laundry and incidentals vary with the individual. The average for laundry expense is about $20 for the school year.

Cost of Text Books

Freshman year	$13.00
Sophomore year	17.00
Junior year	23.00
Senior year	19.00

Incidental Expenses

Students are required, at various times, to take part in the geological, mining and metallurgical trips undertaken into the Black Hills mining district. The geological trip of the Freshman year usually costs the student about $10. Trips in the Junior and the Senior year, for mining and metallurgical exploration, cost a similar sum; so that the student

should figure on a cost of from $30 to $40 at least, for expenses of this kind during his four years' course at the School.

Total cost, including living, fees, books, incidental expenses, etc.:

Freshman year	$280 to $380
Sophomore year	275 to 370
Junior year	320 to 430
Senior year	290 to 385

This estimate does not include expenses incurred outside of school. A certain sum for this purpose should be added according to individual taste.

Opportunity for Self Help

Opportunity for self help in a town of the size of Rapid City is necessarily limited. It is also to be borne in mind that the course of study is an arduous one and requires the student's best effort, and if conscientiously and satisfactorily performed, will leave comparatively little outside time in which to earn funds.

Some students find employment which nets them their board and lodging by doing chores in private families or assisting in some of the stores. Some find employment in the boarding houses. The School is able to assist Junior and Senior students, to some extent, by employing them in the capacity of assistant janitors and similar work.

Students who have become acquainted, by a residence in town for a year or two, find it easier to obtain help than strangers. For this reason it is essential that a student who comes as a stranger to enter the School, should be provided with sufficient funds to carry him through the first year, at the very least.

STUDENT ORGANIZATIONS AND ATHLETICS

The student organizations are: The Students' Association and The Athletic Association. The Students' Association has for its aim the general welfare of the student body and also publishes the official student organ, "The Aurum." The Athletic Association has for its aim the furtherance of legitimate athletics, and has maintained football and baseball teams and track athletics. The School encourages athletics within reasonable limits, in so far as they do not interfere with the work of the school. The "Triangle Club" is a literary association.

CONDUCT

The School has no codified rules of conduct. Students are held to a strict account of their work and are expected to fulfill their inheritance as gentlemen. Failure to live up to the requirements is considered a sufficient cause for severing their connection with the School.

DETERMINATIONS OF MINERALS AND ASSAYING

Minerals are determined free of charge. Samples for determination should be addressed to the Department of Geology, State School of Mines, Rapid City. Assays for gold and silver, etc., and chemical analysis, both quantitative and qualitative, are made at a reasonable rate. Prices will be sent upon application to the Department of Metallurgy. All samples for analysis and assay should be addressed to this department.

REQUIREMENTS FOR ADMISSION

Freshman Class

Requirements for admission to the Freshman class of the Mining Engineering course are as follows:

Fourteen units are necessary for entrance.

Required Units

Arithmetic	1 unit
Algebra	1.5 units
Plane Geometry	1 unit
Solid Geometry	0.5 unit
English	2 units
History	1 unit
Physics	1 unit
Chemistry	1 unit
Total required units	9

Elective Units

German	1, 2 or 3 units
French	1, 2 or 3 units
Latin	2, 3 or 4 units
Greek	1 unit
Spanish	1 or 2 units
English	1 or 2 units
History	1 or 2 units
Mathematics	0.5 unit
Science	1 or 2 units
Drawing	1 unit
Shop Work	1 unit
Civil Government	0.5 unit
Bookkeeping	1 unit

Elective units required for entrance, 5.

A unit course of study is defined as a course covering a school year of not less than 35 weeks with 5 periods of at least 45 minutes each per week.

Method of Entering the School

First: By certificate. Graduates of accredited High schools in the State of South Dakota and other states will be provisionally admitted without examination, if they present proper credentials, specifying to the fact that they have completed the studies mentioned under the requirements for admission.

Second: By examination. All other candidates for admission to the regular mining engineering course will be required to pass entrance examinations in the subjects specified. These examinations are held at Rapid City, on dates mentioned in the calendar. Students who are deficient in subjects required for entrance into the regular mining engineering course are permitted to enter the Preparatory Department, maintained by the School for the special purpose of preparing students so deficient.

Credentials for entrance should be in the hands of the President on or before the date set in the calendar for the examination of credentials by the committee on admission.

Application for admission blanks will be sent upon request.

Description of Units Required for Entrance

Required units:

Mathematics—The four and one-half units which may be offered in mathematics are as follows:

Arithmetic—One unit, complete, including the metric system.

Algebra—One and one-half units. The equivalent of A, B and C algebra described under Preparatory Mathematics in the Preparatory Catalog.

Plane Geometry—One unit. The equivalent of plane geometry described under Preparatory Mathematics.

Solid Geometry—One-half unit. The equivalent of solid geometry described under Preparatory Mathematics.

English—Two units. The equivalent of English 1 and 2 described under Preparatory English and other courses described in that department.

Physics—One unit. The equivalent of physics described under Preparatory Physics in the Preparatory Catalog.

Chemistry—One unit. The equivalent of elementary chemistry described in the Preparatory Catalog.

History—One unit. The History of the United States, English or Ancient History, as described under History, in the Preparatory Catalog.

Elective Units

The equivalent of courses, not mentioned above, described under Mathematics (trigonometry only), Languages History, English and Preparatory Science, in the Preparatory Catalog.

Special Students

Applicants for admission, who are graduates of colleges or technical schools will be admitted as special students and permitted to take any subject they desire, taught in connection with the regular courses. Persons of mature age, who have been employed in

mines and metallurgical plants and who desire to take up special courses, particularly along the lines of mining, metallurgy and geology, will be admitted as special students, provided they show that they have sufficient foundation to take up the work with profit to themselves. No immature persons will be permitted to enter the School to take advanced courses, such as Assaying, Metallurgy, etc.

Admission to Advanced Standing

Graduates of colleges and technical schools who enter the School as candidates for a degree will receive proper credit for all such studies which they have completed and which form part of the curriculum of the School of Mines. The faculty decides these cases upon the basis of individual merit.

DEGREES

The School of Mines offers two degrees: That of Bachelor of Science in Mining Engineering, to the candidate who has successfully completed the regular Mining Engineering course, and that of Bachelor of Science in Metallurgical Engineering, to the candidate who completed successfully the metallurgical option of the Mining Engineering course.

The degree of Engineer of Mines, or of Metallurgical Engineer, will be conferred upon graduates of the Engineering course of the School, who shall have devoted one year to graduate study in the School of Mines, under the direction of the faculty, passing required examinations upon the studies pursued or to those who shall furnish suitable evidence of two years' successful experience in mining or metallurgical work.

Students who complete the studies in the Preparatory Department will receive, therefor, the usual diploma.

THESIS

Every candidate for a degree in the regular Mining Engineering course or in the Metallurgical option of that course is required to present a thesis on some mining, metallurgical, or geological subject before he *will* receive his degree. The candidate for a degree should make a choice of subject and submit it to the faculty for approval not later than October first of the senior year. If no choice is made by that time the faculty will assign a subject. After the choice of the thesis, the candidate for the degree should confer concerning it with the professor in charge of the department within which it naturally falls.

Theses must be submitted to the faculty not later than May 15, and must be typewritten on paper 8.5 by 11 inches in size. Two copies must be furnished; one for the department within which the thesis falls and one for the library. No degrees will be granted unless the conditions concerning theses are fully satisfied.

COURSES AND DEPARTMENTS

The courses given by the School of Mines are:
First—Mining Engineering Course.....4 years
Second—Mining Engineering Course, Metallurgical Option .....4 years

SYNOPSIS OF COURSES

Mining Engineering Course—Freshman Year

First Semester—	Lecture Periods	Laboratory Hours
Mathematics 7, Trigonometry	5	
Chemistry 2, General Chemistry	3	
Chemistry 3, 6, Qualitative Analysis	2	9
Geology 1, General Geology	4	3
Engineering 1, Mechanical Drawing		6
English 5, Composition 5	3	
Second Semester—		
Mathematics 8, Analytic Geometry	5	
Chemistry 2, General Chemistry	3	
Chemistry 3, 6, Qualitative Analysis	2	9
Geology 1, General Geology	4	3
Engineering 1, Mechanical Drawing		6
English 5, Composition 5	3	

Sophomore Year

First Semester—		
Mathematics 9, Calculus	5	
Physics 3, 4, Advanced Physics	2	3
Chemistry 4, 7, Quantitative Analysis	2	9
Mineralogy 1, General Mineralogy	3	3
Engineering 3, Mechanical Drawing		6
Engineering 2, Descriptive Geometry	1	
English 6, Composition 6	2	

Second Semester—	Lecture Periods	Laboratory Hours
Mathematics 10, Calculus	5	
Physics 3, 4, Advanced Physics	2	3
Chemistry 4, 7, Quantitative Analysis	2	9
Mineralogy 2, Blowpipe Analysis	1	6
Engineering 4, Mechanism	2	
Engineering 2, Descriptive Geometry	1	
Engineering 3, Mechanical Drawing		6

Junior Year

First Semester—		
Engineering 7, Surveying	3	9
Geology 2, Physical Geology, or Chemistry 5, 8	3	3
Mathematics 11, Mechanics	5	
Mining 1, Boring, etc	3	
Mining 8, Ore Dressing	3	
Engineering 6, Graphics	1	3
Engineering 5, Mechanical Drawing		6
Second Semester—		
Engineering 7, Surveying	2	9
Geology 3, Petrography, or Chemistry 5, 8	3	3
Mathematics 12, Applied Mechanics	5	
Mining 2, Tunneling, Shaft Sinking	3	
Metallurgy 1, General Metallurgy	3	
Metallurgy 6, Assaying	2	9

Senior Year

First Semester—		
Mining 3, Hoisting, Transportation, etc.	5	
Metallurgy 2, 3, 7, Iron and Steel, Copper and Lead	5	6

	Lecture Periods	Laboratory Hours
Geology 4, Economic Geology, or Metallurgy 5, 8	4	
Engineering 8, 9, Hydraulics and Thermo-Dynamics	4	
Mining 6, Design of Mine Plant		6
Mining 5, Mine Accounting		3
Thesis		3
Second Semester—		
Mining 4, Drainage, Ventilation, etc	5	
Metallurgy 4, 7, Metallurgy of Gold and Silver	5	3
Geology 4, Economic Geology, or Metallurgy 5, 8	4	
Engineering 8, 10, Hydraulics, Power Plant	4	3
Mining 6, Design of Mine Plant		6
Mining 7, Mining Law	1	
Thesis		6

Note: Fifty minutes constitue a lecture period, and sixty minutes a laboratory hour.

DEPARTMENTS OF INSTRUCTION

Department of Mining

Professor Ehle

The instruction in Mining is given by lecture courses, illustrated by lantern views, photographs and drawings; by frequent references to standard works and current literature; by experimental work on various types of ores, carried on in the mining laboratory, and by excursions to near-by mines and mills for the purpose of observing and noting actual conditions of practice.

The department enjoys, to an unusual degree, those advantages which naturally accrue from the School's location. Being contiguous to a world famous mining region, the nearness of large producing mines means much, while the wholesome mining atmosphere in which the student lives, furnishes a never failing supply of food for enthusiasm and interest.

The mining and metallurgical laboratory of the School, which has proven a most valuable adjunct to the work of instruction, is soon to be completely overhauled and re-equipped with modern appliances of approved design. The various operations attendant upon the preliminary treatment of various types of ore will here be carried out by the students, on a scale approaching commercial practice.

It is the intention of the department to inaugurate, during the early part of the summer vacation of 1908, a Summer School of Mining, which shall henceforward constitute a regular annual feature of the work, and attendance upon which shall be obligatory with all regular members of the Junior class. A suitable mining locality having been decided upon, the students, under the direction of instructors, will spend from two to three weeks in the careful study of practical mining, both above and below ground; careful and systematic note taking and sketching of all the principal features being a requirement.

The uniform courtesy and good will shown by the managements of mining enterprises throughout the region, to instructors and students, indicates a wholesome regard for the efforts of the department and constitutes one of its most valuable assets.

The following courses of study are offered by the department:

Mining 1

Borings: The use of the earth auger, drive pipe, etc., in the boring of holes for wells and for prospecting purposes; the boring of deep holes by the churn drill or drop tool; also by the diamond and other rotary drills; the survey of bore holes; the cost of boring.

Breaking ground: The excavation of earth and rock in general; hand tools; mechanical earth excavators; rock drills and drilling; channelers; coal cutters; steam shovels; dredges, etc.; estimates and costs of excavation.

Explosives: Black Powder, nitro-glycerine, gun cotton, and their derivatives; methods of testing, and calculation of heat and pressure developed; pointing and charging of holes; methods of firing; costs of blasting operations.

Junior Year, First Semester: Three lecture periods per week.

Mining 2

Tunneling: The driving of mine tunnels and drifts through rock and through soft or running ground; comparative costs; general discussion of the methods used in driving large tunnels for railroad or other purposes.

Shaft Sinking: The sinking of shafts for mining purposes through soil, rock, quicksand and other water bearing strata, by approved methods, costs of same.

Supporting Excavations: The use of wood, metal and masonry in the lining of shafts and other excavations, their relative cost, strength and dura-

bility; the timbering of stopes, stations, and other working places underground; the preservation of timber.

Junior Year, Second Semester: Three lecture periods per week.

Mining 3

Exploitation: The extraction of mineral by open works; by wells and bore holes; the underground working of veins, bedded deposits, and masses, by methods best suited to each; conditions affecting the choice of methods; costs of ore extraction.

Transportation: Underground and surface; vehicles and motive powers; self acting and engine planes; haulage by the tail rope and by the endless rope systems; electric and compressed air haulage; surface tramways and aerial rope-ways.

Hoisting: Hoisting engines, their construction and chief features; methods of equalizing the load moment on the engine; ropes, cages, skips and safety appliances; gallows frames; pneumatic hoisting; costs.

Senior Year, First Semester: Five lecture periods per week.

Mining 4

Drainage: Sources of mine water; dams and drainage levels; hoisting of water; direct acting and Cornish pumps; use of compressed air and electricity in pumping operations; special devices; examples and costs.

Ventilation and Lighting: Natural and induced

ventilation; furnaces and fans; friction of air in mines; control of air currents; efficiency of ventilating apparatus; the use of candles, open lights, safety lamps and the electric light in underground illumination.

Hygienic Conditions: Surface arrangements for the comfort and convenience of the miner; ascent and descent by ladders, cage or man engine, and relative economy of different methods; accidents, their causes and prevention; rescue and relief of men; mine fires.

Administration: Business management and the principles of employment of labor; organization of mine staff.

Mine Examination: Sampling of ore bodies; estimation of "ore in sight," and the valuation of mining properties; forms of report.

Placer Mining: Sluices, riffles, pipe lines, nozzles and hydraulic elevators, their construction and use; river dredging; costs and results.

Senior Year, Second Semester: Five lecture periods per week.

Mining 5

MR. HUMBERT.

Mine Accounting: Organization of corporations and stock companies, with particular reference to mining and metallurgical companies; discussion of systems of mine and mill accounting; keeping account with the different departments; derivation of cost sheets, etc.; accounts of smelting and milling plants, yard books, furnace records, ore books, smelting records, etc. General methods of business;

buying and selling ores; labor, etc.; organization of the staff of a mining and metallurgical company.

Senior Year, Second Semester: Three laboratory hours per week.

Mining 6

Design of Mine Plant: The student is given certain data, relative to a hypothetical mine, such as maximum depth of hoist, capacity, speed of hoisting, etc., from which he calculates the power needed, selects the type and size of hoisting engines, makes calculations as to the size of reel for flat rope, and drums of different forms, such as to give the best results in the equalization of moment on the engine. He then calculates and designs the gallows frame and shaft house, also such features as ore bins, mine car, cage or skip, etc.

Senior Year, six laboratory hours per week throughout the year.

Mining 7

MR. C. L. LEWIS.

Mining Law: During the year Judge C. L. Lewis will deliver a series of lectures before the members of the Senior class, in which he will discuss and exhaustively review the general mining laws with reference to the public lands, embracing, among others, the following topics: The early history of mining prior to the enactment of the General Mining Law of Congress; the General Mining Laws of the United States and Territories; Mining Districts, their origin, how organized, and the customs, rules and regulations of miners; lands subject to location and who can locate; the proper location of lode claims; the proper location of placer claims;

patent proceedings; timber and stone lands in the mining states, and special laws applicable thereto.

Senior Year, Second Semester: One lecture period per week, fifteen weeks.

Mining 8

Ore Dressing: The principles of ore crushing, description of the various types of crushing machinery; screens and the principles of screen sizing; the theory and practical application of the dressing of ores by water currents, including descriptions of the principal forms of classifiers; jigs and the laws of jigging; slime treatment, and the machinery for its accomplishment; general discussion of the Continental and English systems of ore dressing, and their American modifications; magnetic concentration; concentration by oil; dry concentration; the description and study of typical ore dressing mills.

Junior Year, First Semester: Three lecture periods per week.

DEPARTMENT OF METALLURGY.

PROFESSOR FULTON. MR. VAN NUYS.
MR. BRYANT.

Metallurgical subjects are taught by lecture courses with frequent reference to standard works on the subject, and to the current literature.

This work is supplemented, as far as possible, by laboratory testing and experiments and excursions to neighboring metallurgical works. The School is favorably situated, being contiguous to an active gold mining district, the Black Hills, affording an

unparalleled opportunity to study the practical side of metallurgy, particularly that of gold, on a large scale and at close range.

The stamp mills, cyanide plants, and smelter of Lawrence county are easily reached by rail in a few hours time, while close to the School is the pyrite smelting plant of the Standard Smelting Company to which students have access for the purposes of study.

A well equipped metallurgical laboratory is available for use, as it is desirable that the student should be thoroughly trained in the basic scientific principles of metallurgy. With actual metallurgical operations, on a large scale, the student becomes familiar to such an extent as is desirable during his school years, by the frequent visits to the working plants of the district.

In the laboratory, he becomes thoroughly acquainted with the use of pyrometers, calorimeters, microscopes for the examination of metals and furnace products; close and scientific experiments with the refining and heat treatment of steel, electric deposition of metals, formation of slags, refining of metals, cyanide process and amalgamation, etc., as well as to some extent with the actual working of a furnace, stamp mill, concentrating tables, with which the laboratory is provided.

The department is also equipped with a card index of metallurgical literature, which covers all of the subjects of interest very completely, and is at the service of students.

Metallurgy 1

General Metallurgy: This course consists of lectures on the physical properties of metals; on alloys, their types, nature, and properties; fuels; re-

fractory materials; thermal measurements; discussion of metallurgical principles; slags and furnace products, and their nature; types of furnaces and furnace construction; the means of supplying and heating blast; thermo-chemistry, including a discussion of chemistry at high temperatures; typical metallurgical processes, and the general economic considerations of metallurgy, such as buying and selling of ores and metallurgical products. Students are required to do outside reading from references given in the class room, and hand in for examination papers on topics assigned. Laboratory work covering part of this course is carried out in the Senior year, and is described under Metallurgy 7.

Junior Year, Second Semester: Three lecture periods per week.

No text book required. Chief reference work, Roberts-Austen, Introduction to the Study of Metallurgy.

Metallurgy 2

Iron, Steel, and Other Alloys: This course consists of lectures on alloys, their classification, structure, properties, metallography, taking up more particularly iron and steel. The hardening and tempering of steel is taken up in detail. The metallurgy of cast iron, wrought iron and steel is discussed in principle, but not in great detail. Especial attention is paid to the principles and chemistry of the iron blast furnace and to the Acid Bessemer process, and to the Basic Open Hearth process. Statistics of the iron and steel industry are given. The student is required to do considerable outside reading. Laboratory work in connection with this course is described under Metallurgy 7.

Senior Year, First Semester, seven weeks: Five lecture periods per week.

Text book: Howe's Iron, Steel and Other Alloys.

Metallurgy 3

The Metallurgy of Copper and Lead: This course consists of lectures on the modern metallurgy of copper and lead. It discusses the types of copper and lead ores and the methods suitable for the treatment of the different types of ores. The principles of the reverberatory process for copper are discussed in detail, as it brings out clearly the chemistry of copper. Matte smelting for copper ores is discussed, both pyrite smelting and ordinary matte smelting being taken up in detail, also the roasting of copper ores. This is followed by the discussion of the Bessemerizing of copper mattes and the electrolytic refining of blister copper. Wet methods for copper ores are discussed. This is followed by a discussion of the blast furnace smelting of lead ores including the roasting of ores, composition of lead slags, the products of the furnace, etc. The practice of large centrally located plants, treating both mixed lead and copper ores is taken up; also the reverberatory smelting of lead ores and the desilverization of lead bullion and the refining of lead. Laboratory work for this course is described under Metallurgy 7.

Senior Year, First Semester, eight weeks: Five lecture periods per week.

No text book required. Reference works: Hofman's Metallurgy of Lead; Peters' Metallurgy of Copper; Ile's Lead Smelting; Schnabel's Handbook of Metallurgy.

Metallurgy 4

The Metallurgy of Gold and Silver: This course consists of lectures on the metallurgy of gold-silver, taking up, first, modern stamp mill practice; discussing in detail, mortarboxes, stamps, screens, general battery construction, etc., and the influence of weight of stamp, screen mesh, mortar box dimensions, amount of water on results obtained. Inside and outside amalgamation is taken up in detail; the general mill arrangements; clean up; the influence of other processes following amalgamation is discussed. This is followed by a discussion of the cyanide process for gold and silver ores; wet and dry crushing; crushing in cyanide solution; the separation of sands from slimes; the treatment of sands by percolation; the treatment of slimes by decantation, and filter pressing; the precipitation of gold and silver by the various methods in use; methods of cleaning up and the smelting of cyanide precipitates. The general chemistry of cyanidation and the proper performance of laboratory experiments is discussed. This is followed by lectures on the chlorination process, particularly on the roasting of gold ores and barrel chlorination; the chloridizing roasting of silver ores; pan amalgamation; leaching process for silver ores, etc., concludes the course. Laboratory work for this course is described under Metallurgy 7.

Senior Year, Second Semester, thirteen weeks: Five lecture periods per week. The remaining two weeks are given to a brief discussion of the metallurgy of zinc.

No text book required. Reference works: Julian & Smart's Cyaniding of Gold and Silver Ores;

T. A. Rickard's Stamp Milling of Gold Ores; Henry Louis' Handbook of Gold Milling.

Metallurgy 5

This is a course discussing in greater detail some of the features of Metallurgy 1. It comprises lectures on the physics and chemistry at high temperatures; pyrometry, including a discussion of the principles of the measurements of high temperatures by different methods; Calorimetry, including the determination of calorific power of fuels, and the specific heats of slags, etc., and work in general Metallography. The laboratory work for this course is described under Metallurgy 8.

Senior Year: Four lecture periods per week throughout the year.

(Note: Course 5 is a metallurgic option replacing Geology 4, in the regular mining engineering course. If the majority of the students who elect this work so desire, Course 5, instead of being as above will be replaced by lectures, dealing in detail with the metallurgy of gold. chiefly amalgamation and cyanidation, similar to Course 4, but greatly enlarged in detail and usefulness.)

No text book required. Reference works: Le-Chatelier & Boudouard's High Temperature Measurements; J. H. Vogt's Silicat-Schmelz Losungen, etc., Volumes of the Metallographist, and other works.

Metallurgy 6

Assaying: This course is taught by lectures and by laboratory work, based on the lectures. Elementary chemistry, qualitative and quantitative

analysis are pre-requisites, being necessary for a thorough understanding of the work.

The work in the laboratory includes assaying of reagents; the testing of ores to discover their nature; the study of oxidizing and reducing reactions occurring in assaying; the study of typical assay slags; the assaying of pure gold and silver ores by crucible and scorification methods; the special assaying of copper and zinc ores containing gold and silver; the assaying of arsenical and antimonial ores for gold and silver; the study of cupellation and the factors which influence its results; the assaying of impure ores by the roasting, the nitre, and the excess litharge methods; the assaying of telluride ores, lead bullion, and cyanide precipitates for gold and silver; the assaying of gold and silver bullion; the assaying of lead, tin, bismuth, and antimony ores for their respective base metals; the dry assay of mercury ores for mercury, and concentration and free milling tests on a laboratory scale.

Junior Year, Second Semester: Two lecture periods and nine laboratory hours per week.

Text book: Fulton's Manual of Fire Assaying.

Metallurgy 7

Metallurgical Laboratory: Laboratory practice in pyrometry; the calibration of the thermo couple; taking of cooling curves and freezing point curves; heat curves of furnaces; the examination of iron and steel and other alloys under the microscope; the preparation of metal sections for the microscope; the roasting of ores, noting the formation of sulphates, etc.; the desilverization of lead bullion by means of zinc; the electrolytic deposition of copper; the roasting of gold and silver ores; experiments

with the cyanide process, including the titration of pure and mill solutions with silver nitrate, analysis of cyanide solutions, cyanide experiments with small lots of ore in the laboratory to determine extraction, etc.; finally, at the end of the term, a mill run or smelter run on a large lot of ore.

Senior Year: First semester, six laboratory hours per week; second semester, three laboratory hours per week.

Text book: Clennell's Chemistry of Cyanide Solutions.

Metallurgy 8

Metallurgical Laboratory: Laboratory practice in pyrometry, much more detailed than described for Course 7, including other pyrometers than the thermo couple; determination of calorific power of fuels by the bomb calorimeter; determination of the physical constants of slags, including their specific heat, melting points; microscopic examination of slags, mattes and other furnace products; the working out of metallurgical problems which may suggest themselves.

Senior Year: Three laboratory hours per week throughout the year.

Note: The note applying to Course 5 applies here also. The work of this course is accepted in part as thesis work.

Metallurgy 9

Metallurgical Thesis: Subject assigned by the professor in charge or chosen by the student.

Senior Year: First semester, three laboratory hours per week; second semester, six laboratory hours per week.

DEPARTMENT OF GEOLOGY AND MINERALOGY

PROFESSOR O'HARRA. MR. NELSON.

Library, Laboratory, and Field Facilities

A good, well equipped departmental library is placed convenient to the lecture and laboratory rooms and students are required to make intelligent use of the literature contained therein.

The laboratory equipment and the museum collections, elsewhere described, furnish indispensable material for practical work of many kinds.

Field facilities are unsurpassed. Unusual opportunity is afforded for study in the field of the various geological horizons, including important and valuable economic deposits. Within a few miles of the School the student may observe upturned strata of nearly all geological ages. Twenty miles southwest of Rapid City is the Harney Peak granite area, with its lavish variety of mineral specimens. Surrounding this is a wonderful exposure of Algonkian metamorphic rocks cut in many places by auriferous quartz veins. The Cambrian, Carboniferous, Triassic, Jurassic, and Cretaceous are extensively developed. The famous White River Bad Lands of Tertiary age lie to the southeast of the Hills and afford fossils which have made the region known wherever the science of Paleontology is taught. In the northern part of the Hills important igneous rocks, such as rhyolite, phonolite, andesite, dacite, etc., occur in the form of dikes, sheets and laccoliths. Closely associated with these in slates, quartzites, and limestones, gold ores of the greatest importance are found.

In the autumn, short field excursions are made

by the class to near by points of interest and occasionally a visit of several days is made to more distant localities. Thus the student, in addition to lecture and laboratory instruction, has the advantage of systematically directed field study and with the information thus gained, he should be able to undertake for himself the working out of practical field problems.

Geology 1

General Geology: This course is arranged primarily as introductory to all work in geology and mineralogy. It extends throughout the Freshman year and embraces a comprehensive study of the fundamental principles of geology. The course includes brief, but careful study of dynamical, stratigraphical, structural, chemical, and historical geology, and is conducted by means of lectures, text books, and laboratory work, and frequent excursions to points of particular interest. Under dynamic geology, the atmospheric, aqueous, igneous, and organic agencies are discussed with reference to their bearing on the present and past condition of the earth's surface. Stratigraphical and structural geology consider the conditions of deposition of sediments and of the disturbance of rock masses. A portion of the time allotted to these subjects is devoted to the study of such minerals and rocks as enter most largely into the structure of the earth's surface; also to the methods of geological surveying, including mapping, section making, and special problems. Chemical geology includes the study of the general relation which chemistry bears to geological phenomena, such as the formation, metamorphism, and degeneration of rocks, and the

origin and alterations of the various kinds of mineral deposits. Under historical geology, the physical history of the earth is discussed, the classification and distribution of sedimentary rocks studied, and the methods of correlation explained. The course aims to equip the student with useful information concerning the phenomena and history of the earth, so that he may know the methods used in geological research, and will better understand how to interpret facts gained in the study of economic deposits.

Freshman Year: Four lecture periods and three laboratory hours per week throughout the year.

Text Book: Chamberlain and Salisbury's Geology, Vol. I, Geologic Processes and Their Results.

Mineralogy 1

General Mineralogy: This course is planned to develop such information as may be needed for quick and accurate determination of mineral species in the field. The course is based on lectures, text book, and laboratory work and embraces frequent rigid quizzes on features of chief importance. The physical properties of minerals are dealt with in the early part of the course; a brief study of Crystallography introducing this part of the subject. This is followed by a careful physical study of the chief economic and rock-making minerals in systematic order. Good collections, containing most of the common species of minerals and many of the rarer ones, are arranged for convenient use in the laboratory and museum. Thoroughly accurate observation of labeled specimens from many localities is insisted upon, and

every attention is given to simple, practical methods in the determination of unknown materials.

Sophomore Year, First Semester: Three lecture periods and three laboratory hours per week.

Text Book: Moses and Parsons' Mineralogy, Crystallography, and Blowpipe Analysis.

Mineralogy 2

Blowpipe Analysis: This course is closely associated with Course 1 and continues the same object in view, i. e., the teaching of quick methods of mineral determination. It is chiefly a laboratory study, occupying one lecture period and six laboratory hours througout the second semester of the Sophomore year. Approximately the first third of the semester is devoted to the study of blowpipe methods, known minerals being chiefly used. After this, the student is given only unlabeled specimens, the nature and name of which he is required to learn, keeping for reference a detailed record of all results obtained during the process of determination. It is expected that, upon completing this and the preceding course, the student will have gained a fair working knowledge of approximately two hundred of the common minerals, including the chief features of their distribution, uses, value, and output.

Sophomore Year, Second Semester: One lecture period and six laboratory hours per week.

Text book: Brush-Penfield's Determinative Mineralogy and Blowpipe Analysis.

Geology 2

Physical Geology, including Metamorphism; The purpose of this course is to bring out in some

detail, certain important features, too briefly considered in General Geology, that have close connection with the subjects of Petrography and Economic Geology which follow. Processes of disintegration, denudation, and deposition, crustal disturbances, and metamorphic influences receive attention, particularly with reference to their immediate or ultimate relation to ore formation. The physical action of underground water commands careful study, and where physical phenomena are closely connected with chemical activity, the chemical processes in the influencing of mineral reorganization receive proper consideration. In this, as in all other courses described, features of economic importance will receive particular attention, but it should be understood by the student, that the full aim of the course is to afford opportunity for as thorough and comprehensive a grasp of the subjects in hand as the time devoted to them will allow.

Junior Year, First Semester: Three lecture periods and three laboratory hours per week.

Text Book: Lecture notes.

Geology 3

Petrography: This course is intended especially for mining students who need some training in rock determination, but who have opportunity to devote only a brief time to the subject. It embraces the macroscopic and microscopic study of specimens and is conducted by means of lectures, text books, and laboratory work. The lectures are devoted to the discussion of petrographical methods, the nomenclature of rock species, the principles of rock classification, and the origin, distribution, modes of occurrence, alterations and relations of rock masses.

The laboratory work embraces the study of hand specimens of rocks, the making of thin rock sections and the examination of such sections by means of the petrographical microscope. Little more than a short summary is given of the refined methods of microscopic analysis, most of the time being devoted to the simpler field methods of determining and classifying the commoner rock types. Two good Zeiss petrographical microscopes, together with necessary accessories, are available for use. There is also a Krantz collection of 350 rock types in hand specimens and in thin sections, and a fairly complete series of Black Hills rocks, a number of which have been thin sectioned for study.

Junior Year, Second Semester: Three lecture periods and three laboratory hours per week.

Text Book: Kemp's Handbook of Rocks.

Geology 4

Economic Geology: This course runs throughout the Senior year and includes study of the origin, modes of occurrence and uses of economic mineral products. Beginning with this year, about one-half of the first semester will be given to the study of non-metallic products. This will include the origin, nature, relations, and value of coal, petroleum, natural gas, salines, building stone, clays, cement, materials, fertilizers, abrasives, gems, etc. The rest of this course will be devoted to the study of metallic products, such as gold, silver, copper, iron, lead, zinc, platinum, mercury, nickel, etc. In this, much attention is given to the study of the principles of ore deposition and to the historical development of the theories connected therewith. Careful attention is

given to the chief types of deposits and particularly to localities noted for their wealth of output.

Maps, specimens, and original papers are freely used. Attention is given to the history of mineral development, of the life and comparative importance of various regions and of the influence which economic deposits have exerted upon the regions or countries in which such deposits have been found.

The necessity of individual examination by the student of the best, up-to-date literature is insisted upon, and a reasonable ability to properly use such literature is required. Much attention is devoted to the study of the many economic interests of the Black Hills region and observation of the deposits in the field is encouraged.

Senior Year: Four lecture periods per week throughout the year.

Reference Texts: Beck-Weed's Nature of Ore Deposits; Ries' Economic Geology of the United States; Kemp's Ore Deposits of the United States and Canada.

DEPARTMENT OF ENGINEERING.

PROFESSOR O'BRIEN. MR. BANGS.

The aim of this department is to give the student such training in the class room, drawing room and field as will properly fit him for his career as a mining engineer.

The department occupies two well lighted drawing rooms, 24 by 34 and 24 by 30 feet, in size; lecture room and offices. The rooms are furnished with suitable drawing desks which have separate lockers for each student.

The work of this department extends over a period of three years and includes the following courses:

Engineering 1

Mechanical Drawing: Practical work in the drawing room accompanied by lectures as needed. The work is carried on chiefly by means of individual instruction. The course includes the care and use of instruments; the mounting of sheets; simple geometric construction; orthographic projection; and both free hand and mechanical lettering of titles.

Students taking this course should provide themselves with the following list of supplies, most of which may be obtained from the supply room of the department, at cost:

One set of drawing instruments containing:

One pair 6 in. Compasses, with pen, pencil, and needle points.

One pair 6 in. Dividers.

One 5 1-2 in. Ruling Pen.

One 3 1-2 in. Steel Spring Bow Divider.

One 3 1-2 in. Steel Spring Bow Pencil.

One 3 1-2 in. Steel Spring Bow Pen.

One T Square with 30 in. blade.

One 4 1-2 in. Protractor.

Two Irregular Curves, (Dietzgen, No. 10 and No. 19.)

One 7 in. 30 deg. by 60 deg. Triangle.

One 1-8 in. 45 deg. Triangle.

One 6H Drawing Pencil.

One Pencil Pointer.

One Pencil Eraser.

One Ink Eraser.

One Sponge Rubber.

One dozen Thumb Tacks.

One Pulp Board.

Eighteen sheets Whatman's H. P. 17x22 in. Drawing Paper.

One bottle Mucilage or Glue.

One bottle Black Drawing Ink.

One bottle Red Drawing Ink.

Drawing boards and key for locker are furnished by the School on the payment of a fee of $1 per year; 50 cents of this is refunded. on return of key.

Freshman Year: Six laboratory hours per week throughout the year.

Text Books: Morris' Geometric Drawing for Art Students; Students' Alphabets.

Engineering 2

Descriptive Geometry: The work in descriptive geometry is necessary in order that the second and third year drawing may be done intelligently. The course is taken up as outlined in Hall's Descriptive Geometry. It includes the projection of the point and line and the representation of planes and problems relating thereto; generation, classification, and intersection of surfaces.

Sophomore Year: One lecture period per week throughout the year.

Text Book: Hall's Descriptive Geometry with Plates.

Engineering 3

Mechanical Drawing: This course is supplementary to the class room work of descriptive geometry and mechanism. The work of this course

takes up the development and intersection of plane and curved surfaces. It is designed to run parallel to the course in mechanism, consequently it includes the drawing of cams and gear teeth and analysis of link work.

Sophomore Year: Six laboratory hours per week throughout the year.

Text Book: Reed's Mechanical Drawing.

Engineering 4

Mechanism: This course is given by means of lectures and recitations. The work takes up the laws which govern the moving parts of the machine; the design of cams, gear teeth, and link work. The various parts of the machine are discussed in the class room and then are carefully and accurately constructed on the drawing board so that the student may gain a clear idea of the design of the various mechanical movements. This course furnishes a basis for the work of Engineering 3 in the second semester of the Sophomore year.

Sophomore Year, Second Semester: Two lectures periods per week.

Text Book: Stahl & Wood's Elementary Mechanism.

Engineering 5

Mechanical Drawing: This course is for the purpose of giving instruction in methods of representing machine parts. The student is required to make free hand sketches of various parts and then make from his sketch a finished working drawing,

properly lettered and dimensioned. Tracing and blue printing are part of the course.

Junior Year, First Semester: Six laboratory hours per week.

Engineering 6

PROFESSOR EHLE.

Graphical Statics: The object of this course is to give an understanding of the theory of the graphical solution of internal stresses in a framed structure, arising from steady and moving loads, from the pressure of the wind, etc. The student is required to determine by graphical methods on the drawing board, the nature and amount of internal stresses in the various members of such simple roof and bridge trusses and head frames as are assigned him.

Junior Year, First Semester: One lecture period and three laboratory hours per week.

Text Book: Hosking's Elements of Graphical Statics.

Engineering 7

Surveying: It is the desire of the department to bring, as far as is practicable, theory and practice side by side. For this reason, the discussions in the class room are confined to such principles as can be given a practicable application in the field or drawing room.

The institution is provided with all the instruments and accessories necessary to carry on the work. Additional instruments are purchased as the need for them arises.

For the performance of the field work, the class is divided into squads with just a sufficient number

in each to properly carry on the work. Each student is required to take his turn at every part of the work; to use each instrument as the occasion demands; to make his own notes and computations; and finally to accurately plot them in the drawing room.

The course outlined is as follows: Linear measurements by means of pacing and chain or tape; adjustment and use of the engineer's transit and level; traversing; principles of land surveying; adjustments and use of the plane table; mine surveying, including the location and patent surveying of claims; shaft plumbing and underground connections; adjustment and use of the solar instrument; geodetic surveying, including the measurement of a base line; measurement of horizontal angles; computations for the adjustment of the triangulation system; determination of the meridian by means of the solar instrument; determination of latitude; direct solar observation and observation on Polaris; measurements of volumes. Railroad surveying will receive as much time as the conditions will permit.

Junior Year: First semester, three lecture periods and nine hours field work per week. Second semester, two lecture periods and nine hours field work per week.

Text book: Johnson's The Theory and Practice of Surveying.

Engineering 8

Hydraulics: The student takes up this course with a knowledge of hydrostatics from his work in Physics 3, and is thus prepared to commence with hydraulics proper, or the study of the laws governing the moton of water. He learns the methods of

commercial measurement of water by both weirs and orifices. The problems include the computations of diameters of pipes; pressures, and energy of confined water; dimensions of channels and ditches; velocity of flow, etc.

The School is favorably situated for field work in hydraulics. Rapid creek is a mountain stream with a fall of about 1.6 per cent., offering splendd facilities for wier and velocity measurements; two large irrigation ditches are adjacent to the School, and Rapid City has three water-power plants within the city limits. The students thus have opportunity to visit and study hydraulic power plants in successful operation.

In the latter part of the course the student designs and makes drawings for a complete water-power plant, calculating the size of flumes and ditches, cost of material and excavation; makes plans for wheels, tailrace, etc., as a practicing engineer would be required to do.

Senior Year: Two lecture periods per week throughout the year. Second semester, three laboratory hours per week.

Text book: Mansfield Merriman's Treatise on Hydraulics.

Engineering 9

Thermo-Dynamics: This course begins with a discussion of the theory underlying the operation of heat engines. The theory of the operation of the ideal engine is developed, and the principles governing the actions of steam and gas engines, air compressors and refrigerating machines are fully discussed.

Senior Year: First semester, two lecture periods per week.

Engineering 10

Design of Power Plants: This course applies practically the principles developed in the preceding one. It embraces the history of the development of the steam engine, and a study of the types in successful use: the application of the indicator and Prony brake, and the testing of boilers and fuels.

The School has three 40 horse-power boilers and a 40 horse-power Corliss engine; also a gasoline and a kerosene engine. This apparatus is available for laboratory work in this line.

Under the head of hydraulics, the Seniors design a water power plant. (See hydraulics.) In this course the students learn to design the necessary electrical equipment to commercially transmit this power to distant points.

Senior Year: Second semester, two lecture periods per week.

DEPARTMENT OF CHEMISTRY

PROFESSOR COOLBAUGH. MR. MELLINGER.
MR. BETTERTON.

The courses in chemistry are designed to give to mining and to metallurgical engineers the knowledge of chemistry most essential to their work. Especial emphasis is given to the laws underlying the science; the separations, estimations, etc., being made with these principles in mind. The purpose is to excite in the student an interest in experimentation, to cultivate methods of accuracy and rapidity in manipulation, and to teach the proper correlation of the results of experiments.

Chemistry. 2

General Chemistry: This course should give the student a knowledge of the principal theories and laws of science. The following subjects are discussed in an elementary way: Atoms and molecules, gases, liquids, solids, solutions, thermo and electrochemistry, and chemical equilibrium. Some time is also given to a study of industrial chemical processes, such as the manufacture of acids, alkalies, clay and cements, cyanides, gas and ammonia. In addition, there is a brief study of the metallic elements, introducing elementary metallurgy when those of commercial importance are under consideration.

Freshman Year: Three lecture periods per week throughout the year.

Reference books: Richter's Inorganic Chemistry; Ostwald's Principles of Inorganic Chemistry; Thorp's Outlines of Industrial Chemistry.

Chemistry 3

Qualitative Analysis: The class work in qualitative analysis begins with an outline of the general scheme of analysis. Then follows a minute study of the metals and the acid radicals with their detections and separations. Emphasis is placed on the principles of oxidation and reduction, the law of mass action and the theories of ionization and hydrolysis. Separations are made before the class in order to give an idea of the correct use of reagents and of the methods for rapid manipulation.

Freshman Year: Two lecture periods per week throughout the year.

Reference books: Prescott & Johnson's Qualitative Analysis; Treadwell's Qualitative Analysis.

Chemistry 4

Quantitative Analysis: The class work in quantitative analysis consists of: discussions of the relative merits of methods applied in the laboratory, the study of articles and reviews from chemical periodicals, and the subject of chemical calculations.

Sophomore Year: Two lecture periods per week throughout the year.

Reference books: Miller's Notes on Quantitative Analysis; Miller's Calculations of Analytical Chemistry; Treadwell's Quantitative Analysis; Sutton's Volumetric Analysis; Lowe's Technical Methods of Ore Analysis.

Chemistry 5

Metallurgical Chemistry: This course is to familiarize the student with the analytical methods used in conjunction with metallurgical processes. The subjects studied are: The technical methods connected with the metallurgy of iron, steel, zinc, lead, and copper; the determinations of bismuth, mercury, cadmium, tin, nickel, and the rare elements of commercial importance, and the analysis of electrolytic slimes.

Prerequisites: Chemistry, 2, 3 and 4, or equivalents.

Junior Year: One lecture period per week throughout the year. Required of Juniors taking the metallurgical option.

Chemistry 6

Qualitative Analysis, Laboratory: This covers the separation of metals and acids in solutions, dry mixtures, minerals, slags, and alloys. Numerous

tests are made with the blowpipe and the spectroscope is used for the detection of the alkali and alkaline earth metals.

Freshman Year: Nine laboratory hours per week throughout the year.

Chemistry 7

Quantitative Analysis, Laboratory: The course covers the subject of mineral analysis, including both gravimetric and volumetric methods. The analyses required are: Magnesium sulphate, sodium or other chloride, potassium alum, coal, iron ammonium alum, iron ore, pig iron, spiegel or manganese ore, zinc ore, copper ore or matte, brass, lead ore, chromic iron, limestone, arsenic ore, antimony ore, slag, and gas analysis.

Sophomore Year: Nine laboratory hours per week throughout the year.

Chemistry 8

Quantitative Analysis, Laboratory: Work corresponding to Chemistry 5.

Junior Year: Six laboratory hours per week throughout the year.

DEPARTMENT OF MATHEMATICS

PROFESSOR MCLAURY. . . . . .

The engineer, from the very nature of his work, must of necessity meet many difficult problems. His success will depend on his ability to solve them. As it is impossible to tell in advance just what experiences a given student will meet, that course is best which results in mental power. It is not a question

of what the student has done, but what he can do. Has he a comprehensive grasp of the subject; has he thoroughly mastered the principles; can he apply these principles to kindred subjects?

The aim of this department will be to give the student a thorough knowledge of the principles of mathematics so as to enable him to apply them readily to the solution of practical problems. Original work is encouraged, and an effort is made to cultivate the habit of exact logical reasoning, and to stimulate independent thought. Both rapidity and accuracy are expected in all mathematical work. The great importance of mathematics as the basis of a scientific education justifies the requirement of all elementary courses, as a prerequisite to the Mining Engineering Course.

No course in Algebra is offered in the Engineering Department. However, in the following courses, particular pains will be taken to explain all the more difficult algebraic processes as they occur. Several subjects in higher algebra will be discussed, each at the point where it is required for immediate application. Students who have not studied algebra for a year or more, should make a careful review before entering school, for a thorough knowledge of the elements of algebra is essential to the successful completion of all subsequent courses.

Mathematics 7

Trigonometry: Plane, analytical, and spherical. Considerable attention is paid to the consistent and scientific development of the fundamental conventions and definitions, and to the derivation and transformation of trigonometric expressions. Many practical problems are solved.

Freshman Year: First semester, five lecture periods per week for sixteen weeks.

Text book: Phillips & Strong's Trigonometry.

Mathematics 8

Analytic Geometry: This course includes the following subjects: Loci; straight lines; transformation of co-ordinates; circles; conic sections; the general equation of the second degree and higher plane curves.

The theory will be developed by lectures.

Freshman Year: Second semester, five lecture periods per week for eighteen weeks.

Text book: Nichol's Analytic Geometry, with Smith & Gale, Puckle, Ashton, and C. Smith for reference.

Mathematics 9

Differential Calculus: The text book work is supplemented by lectures. This course will include the discussion of a few subjects in higher algebra and will be preceded by a short course in solid analytic geometry, based on Nichol's Analytic Geometry.

Sophomore Year: First semester, five lecture periods per week.

Text book: Osborn's Calculus.

Snyder & Hutchinson, Granville, and Williamson are used for reference.

Mathematics 10

Differential and Integral Calculus: This course is a continuation of the last course and will include the most of the work in Osborn's Calculus.

Sophomore Year: Second semester, five lecture periods per week.

Mathematics 11

Mechanics 1: The theory is developed by lectures. The aim is to present the fundamental principles in as clear and simple a manner as possible. Many problems will be solved to enforce the principles and to develop ability in the student to apply what he has learned to practical problems. Particular effort is made to cultivate the power of the student to use calculus methods when needed. The course includes the following subjects:

Statics: First principles; units, composition and resolution of concurring forces; composition and resolution of forces acting on a rigid body; conditions of equilibrium: center of gravity; friction; virtual velocities; machines; the funicular polygon and the catenary.

Kinematics: Rectilinear and curvilinear motion; composition and resolution of acceleration; angular velocity and angular acceleration; projectiles, etc.

Kinetics: Laws of motion; motion under the action of a variable force; motion in a resisting medium; constrained motion; the simple pendulum; centripetal and centrifugal forces.

Junior Year: First semester, five lecture periods per week.

Text book: Bowser's Analytic Mechanics; the works of Church, DuBois, Hoskins, Johnson, Lanza, Todhunter, and Routh, are used for reference in this and the following course.

Mathematics 12

Mechanics 2: The topics discussed include:

Kinetics (Continued): Impact; work and energy; moment of inertia.

Strength of Materials: The resistance and elasticity of the materials of engineering; fundamental assumptions of the common theory of beams; distribution of stresses in beams; shearing forces, bending moments, and deflections of beams; the common and exact theory of torsion, flexure, elastic limits; working stresses and ultimate resistance of cast-iron, wrought iron, steel, and timber; pipes and riveted joints; posts and columns; the design of posts, beams, shafts, etc.

Junior Year: Second semester, five lecture periods per week.

Text book: Merriman's Mechanics of Materials.

DEPARTMENT OF PHYSICS.

MR. BANGS.

The courses offered by the department are as follows:

Physics 3

Advanced Physics: The subjects treated in the first semester are: Mechanics, hydrostatics, sound, and light. The mechanics of fluids receives the benefit of much time and the complete treatment here serves as an introduction to the study of hydraulics in the Senior year. The work of the semester ends with a review of the principles of light, and a discussion of the spectroscope and polariscope. In the second semester the course is continued by treating

the subjects, heat, electricity, and magnetism. In the subject of heat, particular attention is given to the expansion of gases and vapors, specific heat, and the relation of heat and energy, that the student may have a good foundation for thermo-dynamics.

The subject of electricity receives detailed and careful consideration. The laws of electrolysis, resistance, and potential are developed, and a comprehensive study of electrical measuring instruments, dynamos, motors, etc.. is entered into. The relative advantages of alternating and continuous currents for different purposes is pointed out. This course gives the student good preparation for his subsequent work in mining and metallurgy.

Sophomore Year: Two lecture periods per week throughout the year.

Text book: Carhart's University Physics.

Physics 4

Laboratory work in connection with Physics 3: The aim of the laboratory work in this course is not so much to perform a large number of experiments, as to learn to do the work with care and accuracy. Determinations are made of the coefficient of friction; buoyancy of the atmosphere; acceleration of gravity, etc. Complete reports of all experiments are required, and when possible, they are accompanied by appropriate curves.

In the experimental work in heat, particular attention will be given to such practical determinations as the calorific power of fuels; melting and boiling points; and the expansion of vapors and gases.

The laboratory is well equipped for an extensive course in electrical testing. The apparatus includes

a permeameter, magnetometer, condensers, induction coils, static machines, X-ray tubes, etc. Dynamos, motors, and lamps are available for the purpose of making tests of commercial efficiency. The school machine shop is at the disposal of students for the purpose of constructing apparatus for research work.

The general application of electricity to mining makes this course of value and interest to the mining engineer.

Sophomore Year: Three laboratory hours per week throughout the year.

DEPARTMENT OF ENGLISH

PROFESSOR MCLEARIE.

The aim of this department is to give the student a command of good idiomatic English, and to aid him in the development of the art of expression. Especial emphasis is laid upon the importance of good composition in technical work. Attention is called to the absolute necessity that every professional man should be able to express his thoughts with clearness and accuracy.

English 5

Composition 5: The elements of effective writing: This course gives both theoretical and practical instruction. The theory is taught by class room work based on standard text books. The practice is obtained by exercises written in the class room, and by weekly themes. At least one theme a week is required, and every theme is returned to the student to be revised or rewritten.

Freshman Year: Three lecture periods per week throughout the year.

Text books: Wendell's English Composition; Pearson's Principles of Expression.

English 6

Composition 6: This course supplements the work of the Freshman year by giving further practice in narrative, expository and argumentative writing. A study is made of the works of such authors as will aid in practical composition work. Three themes are required, each containing from 800 to 1,000 words. There will be a conference on each theme.

Sophomore Year: First semester, two lecture periods per week.

MINING STUDENTS.

SENIORS.

Anderson, Frank.....Rapid City, South Dakota
Bryant, Frank.....Spearfish, South Dakota
Cornell, Wharton.....Wilmington, Delaware
Ellerman, Otto.....Yankton, South Dakota
Evans, Edward.....Newcastle, Wyoming
Matson, Bernard.....Deadwood, South Dakota
Mellinger, Lloyd.....Deadwood, South Dakota
Morris, Milton.....Rapid City, South Dakota
Van Nuys, Claude.....Flandreau, South Dakota
Whitmore, Charles.....Canton, South Dakota
Wells, Leon.....Aberdeen, South Dakota
Winters, Fred.....Mazeppa, Minnesota

JUNIORS.

Coolidge, Cyril.....DeSmet, South Dakota
Goodner, Ivan.....Pierre, South Dakota
Hebbethwaite, Leon.....Evanston, Illinois
Ives, Glen.....Alexandria, South Dakota
Overpeck, Lem.....Rapid City, South Dakota
Sparling, William.....Rapid City, South Dakota
Smith, Amos.....Yankton, South Dakota
Woodward, Don.....St. Marys, Ohio

SOPHOMORES.

Bennett, Richard.....Pierre, South Dakota
Betts, C. W.....Mitchell, South Dakota
Betterton, Jesse.....Columbus, Nebraska
Coolidge, Roy.....Columbus, Nebraska
Elliott, John.....Columbus, Nebraska
Hunter, George.....Deadwood, South Dakota
Hartgering, McRae.....Rapid City, South Dakota
Hogarth, John.....Deadwood, South Dakota
Ickes, Eugene.....Deadwood, South Dakota
Keelyn, James.....Evanston, Illinois
Ledyard, Louis.....Sioux Falls, South Dakota
Read, Herbert.....Rapid City, South Dakota
McLain, Dan.....Yankton, South Dakota
Olmstead, Lora.....Rapid City, South Dakota
Homer, Dudley.....Somersville, Connecticut
Rose, Walter.....Pierre, South Dakota

Sargent, Arthur.....Rapid City, South Dakota
Stoner, J. William.....Lincoln, Nebraska

Freshmen.

Arpeno, Louis.....Greenmont, South Dakota
Ballard, Peter.....Rapid City, South Dakota
Boyd, Robert.....Rapid City, South Dakota
Eddy, John.....Helena, Montana
Jeffries, Zay.....Pierre, South Dakota
Moore, Grant.....Hot Springs, South Dakota
Nelson, Ole.....Rapid City, South Dakota
Long, Leon.....Amboy, Illinois
Ryan, Raymond.....Somersville, Connecticut
Saville, Joe.....Keystone, South Dakota
Schraps, Paul.....St. Louis, Missouri
Tillotson, Kenneth.....Somersville, South Dakota
Wheelock, Harry.....Rapid City, South Dakota

Special Students. (Mining)

Arentz, Paul.....Oak Park, Illinois
Daniels, A. D. B.....Lead, South Dakota
Hartgering, Genevieve.....Rapid City, South Dakota
Millard, B. E.....Lead, South Dakota
Nyswanger, Lillian.....Rapid City, South Dakota
Ossa, Ignatius Diaz.....Santiago de Chile
Rowe, William.....Maitland, South Dakota
Shutz, Adolph.....Portland, Oregon

ALUMNI OF THE SOUTH DAKOTA SCHOOL OF MINES.

1888

John W. Hancher, B. S., M. A., President Iowa Wesleyan University, Mt. Pleasant, Iowa.

1890

Carrie Fiegel, B. S., Rapid City, South Dakota.

Benjamin Poznansky, B. S., Denver, Colorado.

Eva R. Robinson, B. S., Instructor in Domestic Science, Quincy High School, Quincy, Illinois.

1891

Ottilie H. Behrens, B. S., Rapid City, South Dakota.

1901

G. Howell Clevenger, B. S., School of Mines; M. A., Columbia University, New York. 1903, Mill Superintendent, Horseshoe Mining Co., Deadwood, S. D. 1904-06, Instructor in Metallurgy, Stanford University, California. 1906, Consulting Engineer, San Francisco, Cal.

Max R. Hopkins, B. S., with Scranton Correspondence School, Kansas City, Mo.

1902

Areli C. Overpeck, B. S., E. M. 1902-03, Chemist and Assayer, National Smelting Co., Rapid City, S. D. 1903, Superintendent Dakota-Calumet Mining Co., Hill City, S. D.

C. C. Thompson, B. S., E. M. 1902-03, Assayer, Clover Leaf Mining Co., Roubaix, S. D. 1904, United States Deputy Mineral Surveyor, Deadwood, S. D. 1905, Assayer Lone Star Mining Co., Pis Pis, Nicaragua. 1906, United States Deputy Mineral Surveyor for Nevada, Goldfield, Nevada.

1904

U. S. S. Arentz, B. S., E. M. 1904-05, with Black Rock Mining Co., Constellation, Arizona. 1905, with Trade Dollar Extension Co., Silver City, Idaho. 1906, Engineer and Assistant Superintendent of Utah Apex Mining Co., Bingham Canyon, Utah. 1906, Superintendent Nevada Douglas Copper Co., Yerington, Nevada.

Arthur E. Hall, B. S., Met E. 1904-05, Smelter work, Butte, Montana, and Jerome, Ariz. 1904-05, Chemist, National Smelting Co., Rapid City, S. D. 1906-07, Superintendent Standard Smelting Co., Rapid City, S. D. 1907, Chemist Mountain Copper Co., Keswick, California.

Elmer W. West, B. S., E. M., Engineer, Ely, Nevada.

Guy E. Wolcott, B. S., Cripple Creek, Colo.

1905

Oscar A. Anderson, B. S. 1905, Assayer, Dakota Mining Co., Deadwood, S. D. 1906, Mill Superintendent, Dakota Mining Co., Deadwood, S. D.

Hollis W. Overpeck, B. S. 1905, Assayer, Kimberly Gold Mining Co., Jardine, Montana. 1905, Engineer and Construction Superintendent same company. 1906, Metallurgist, Buckskin Mountain Copper Co., Fredonia, Ariz.

James Halley, Jr., B. S. 1905, Cashier Keystone Bank, Keystone, S. D.

1906

Louis Penhoel, B. S., Assayer and Chemist, Grand View Mining Co., Silver City, S. D.

Peter Whytock, B. S., Goldfield, Nevada.

William Gaines, B. S., Reliance Mining Co., Deadwood, S. D.

B. D. O'Brien, E. E., Rose Polytechnic, Indiana; B. S., South Dakota School of Mines. 1898-1905, Mechanical Engineer, Golden Reward Mining Co., Deadwood, S. D. 1906, Instructor in Engineering, South Dakota School of Mines.

J. B. Read, B. S., Chemist, Standard Smelting Co., Rapid City, S. D. Chemist, Bishop Creek Mining Co., Bishop, California.

Harry T. Curran, B. S., Mitchell, S. D.

Frederick Wetherald, B. S., Homestake Mining Co., Lead, S. D.

Earl Van L. Smith, B. S.

Edwin Coolidge, B. S., Assayer, Kimberly Gold Mining Co., Jardine, Montana.

Herbert Seiter, B. S., Assayer, Reliance Mining Co., Deadwood, S. D.

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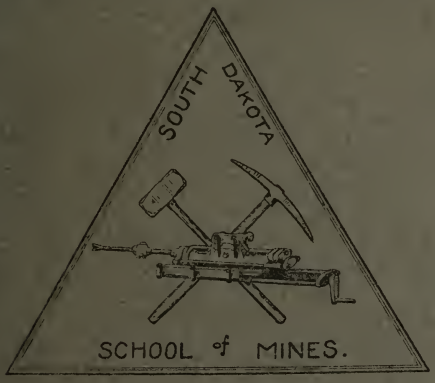
THE
JOHN CRERAR

ANNUAL CATALOGUE OF
SOUTH DAKOTA STATE

SCHOOL of MINES

RAPID CITY :: SO. DAKOTA



NINETEEN HUNDRED EIGHT
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BROWN & SAENGER, PRINTERS, SIOUX FALLS, S. D.

THE
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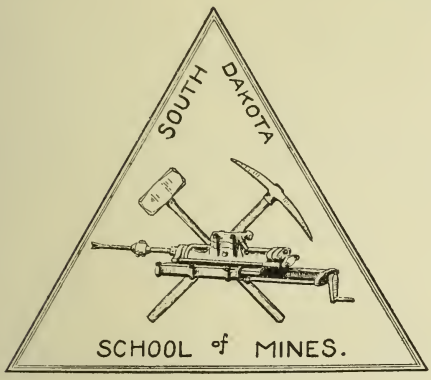
THE SOUTH DAKOTA STATE SCHOOL OF MINES



ANNUAL CATALOGUE
1908-1909

YEARLY CALENDAR

1908

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COLLEGE CALENDAR

School Year begins ---------- Wednesday, September 16, 1908

Entrance Examinations begin ---------- September 14, 1908

Registration Committee considers applications for Advanced Standing and Credentials for Admission without examinations ---------- September 15, 1908

Thanksgiving Day recess, -- November 26 to November 29, 1908

Christmas vacation ------ December 24, 1908 to January 3, 1909

Examination Week, -- January 25 to January 30, inclusive, 1909

First Semester ends ---------- January 30, 1909

Second Semester begins ---------- February 1, 1909

Washington's Birthday Anniversary ---------- February 22, 1909

Spring Recess ---------- April 12 to 17, 1909

Arbor Day ---------- May 1, 1909

Memorial Day ---------- May 30, 1909

Examination Week ---------- May 24 to 29, 1909

Baccalaureate Sermon ---------- May 30, 1909

Granting of Diplomas in Preparatory Department ----------

---------- May 31, 1909

Faculty and President's Reception ---------- June 1, 1909

Commencement and Conferring of Degrees ------ June 2, 1909

Second Semester ends ---------- June 3, 1909

REGENTS OF EDUCATION

MEMBERS OF THE BOARD

A. W. Burtt, Huron, Term expires January 1, 1909

Frederick A. Spafford, Flandreau .....
.....Term expires January 1, 1909

Albert M. Anderson, Sturgis .....
.....Term expires January 1, 1911

E. C. Ericson, Elk Point .....
.....Term expires January 1, 1913

A. J. Norby, Sisseton .....
.....Term expires January 1, 1913

OFFICERS OF THE BOARD

E. C. Ericson, President, Elk Point
Irwin D. Aldrich, Secretary, Big Stone
C. H. Cassill, (State Treasurer)
Treasurer Ex-Officio

REGENTS' COMMITTEE IN CHARGE OF THE SCHOOL OF MINES

A. M. Anderson A. J. Norby

FACULTY

CHARLES HERMAN FULTON, President and Professor of Metallurgy.
E. M., Columbia University.

CLEOPHAS CISNEY O'HARRA, Professor of Mineralogy and Geology.
A. B., Carthage College. Ph.D., Johns Hopkins University

HOWARD LINCOLN MCLAURY, Professor of Mathematics.
A. B., Oberlin College. A. M., Harvard University.

MARK EHLE, JR., Professor of Mining.
E. M., Colorado School of Mines.

MELVILLE FULLER COOLBAUGH, Professor of Chemistry.
B. S., Colorado College. A. M. Columbia University.

JOHN MCLEARIE, Professor of English.
A. B. Macalester College. A. M. University of Chicago.

BARRINGTON D. O'BRIEN, Professor of Engineering.
B. S., South Dakota School of Mines.
E. E., Rose Polytechnic.

CLARENCE LESLIE LEWIS, Lecturer on Mining Law.
University of Michigan.

ADELBERT DALE HUMBERT, Principal Preparatory Department; Instructor in Mathematics and Preparatory Science.
Cornell College.

HERBERT A. STURGES, Instructor in Physics.
A. B., Oberlin College.

OSCAR ALLEN ANDERSON, Instructor in Metallurgy.
B. S., E. M., South Dakota School of Mines.

CHRISTIAN TRYGSTAD, Instructor in Modern Languages.
A. B. St. Olaf College.

KATHERINE KILLEEN, Instructor in History.
A. B. University of Michigan.

DELLA MAY HAFT, Librarian.
Ph. B. University of Chicago.

LULU QUIST, Registrar and Secretary to the President.

RAY COOLIDGE, Assistant in Chemistry.

WILLARD C. MARSHALL, Assistant in Assaying.

JESSE OATMAN BETTERTON, Assistant in Chemistry.

CYRIL COOLEDGE, Assistant in Geology.

OTHER EMPLOYES

WILLIAM A. COURSEN, Superintendent of Grounds and Buildings.

MRS. A. O. ANDERSON, Janitor.

FRANK BOYD, Fireman.

STANDING COMMITTEES OF THE FACULTY

Committee on Admission and Registration:

Professor McLaury
Professor Ehle
Professor Coolbaugh
Mr. Humbert

Committee on Emergencies and Discipline:

Professor O'Harra
Professor McLearie
Professor Ehle
Professor McLaury

Committee on Course of Study:

Professor Ehle
Professor O'Harra
Mr. Humbert
Professor O'Brien

Committee on Catalogue and Publications:

Mr. Humbert
Professor O'Brien
Professor McLaury

Committee on Library:

Miss Haft
Miss Killeen
Professor Coolbaugh

Committee on Athletics:

Professor McLearie
Professor O'Harra
Professor Coolbaugh

Committee on Student Organization:

Professor McLearie
Professor McLaury
Professor Coolbaugh
Mr. Humbert

The regular meeting of the faculty is held on the first Monday of each month.

GENERAL STATEMENT

ESTABLISHMENT OF THE SCHOOL, ETC.

The School of Mines is a state educational institution, and is at present almost wholly maintained by appropriations of the State Legislature. It is endowed with 40,000 acres of land, lying in the State of South Dakota, and a grant from the federal government. It receives a comparatively small income from the rental of these lands, which are, however, steadily increasing in value. The school is under the Regents of Education. The regents, five in number, are appointed by the governor, confirmed by the senate, and have control of the various public institutions of learning maintained wholly, or in part, by the State as State Institutions.

The following is an extract from the act of the legislature, establishing the School of Mines.

Section 1. (School of Mines Established.) That a School of Mines for the Territory of Dakota be established at Rapid City, in Pennington County, Dakota Territory. It shall be the object of such School of Mines to furnish facilities for the education of such persons as may desire special instruction in Chemistry, Metallurgy, Mineralogy, Geology, Mining, Milling, Engineering, Mathematics, Mechanics, Drawing, the Fundamental Laws of the United States, and the Rights and Duties of Citizens.

Approved March 7, 1885.

HISTORY AND AIM OF THE SCHOOL

The chief aim of the State School of Mines is to offer young men a thorough education in mining and metallurgical engineering, believing that thereby the exploitation of the mineral resources of the State will be aided. Whenever it is possible, the School also

aids the development of the mineral resources by the investigation of mining and metallurgical problems which arise in the state. At the present time, many graduates of the School are employed in responsible positions in the Black Hills and throughout the West generally, and are doing much toward the developing of the State's mineral wealth. It is well known that the successful exploitation of the Cambrian ores of the Black Hills was due in a large measure to the experiments performed at the State School of Mines. This refers particularly to the chlorination process and to sulphide smelting. The School issues, from time to time, bulletins treating of Black Hills economic geology, and of mining and metallurgical methods, which can be obtained by those interested, upon request.

The first building of the School was erected in 1885, and is a three-story brick structure in which were originally, chemical and assay laboratories, and class rooms. The staff of instructors was necessarily small and the course by no means complete. The School, however, under able management, steadily though slowly gained in reputation, and, in 1887, erected a second building to serve the purpose of a metallurgical laboratory. This building is 138 by 60 feet in size, and was fitted with metallurgical and mining experimental machinery In 1901 what is now the Main Building of the School was erected, the legislature appropriating $20,000 for that purpose. In 1903 another $20,000 was appropriated by the legislature for an addition to the Main Building, and $5,000 was appropriated for the construction of a separate heating plant. In 1905 $8,000 was appropriated for the improvement of the metallurgical laboratory and extension of the heating plant, etc., and in 1907, $15,000 for additions to the metallurgical laboratory.

The number of buildings and equipment, at the present time, is such as to give good facilities for thorough instruction in mining and metallurgy, and allied subjects.

LOCATION

The School of Mines is located in Rapid City, in the foot hills of the Black Hills of South Dakota. It is on the Chicago & Northwestern Railway, on that branch extending from Omaha to Deadwood and Lead, South Dakota. Rapid City has direct connection with the eastern part of the state, by means of a branch of the same railroad from Pierre; and also by the Chicago, Milwaukee & St. Paul Railway from Chamberlain, South Dakota. It has also connection with the Burlington system by means of the Missouri River & Northwestern Railway from Rapid City to Mystic.

Rapid City is a growing city of about 5,000 inhabitants. It was founded in 1876 and is the most beautifully located town in the Black Hills. It is situated on Rapid Creek, and a half hour's walk takes one either out on the plains or into the hills. It has large stores of all kinds, and living is comparatively cheap for a western town. It offers many advantages as a college and residence city. It has seven churches, representing practically all the principal denominations. There are costly water works fed by springs, four miles back in the hills; also a modern illuminating gas works and an electric lighting plant, furnishing the city with light and a modern sewer system.

The elevation of the city is 3,200 feet above sea level and the climate is a very healthful one, the winters being usually mild and the summers cool. The climate is dry, the average rainfall being about 20 inches.

There is much social life in the town, and students, after becoming acquainted, may enjoy the influences of home life. The students of the School find board and lodging in the homes, as the School does not maintain a dormitory.

The distance to Deadwood is only 46 miles and but a little more into the heart of the great producing mining section of the Hills. The mining districts of Keystone, etc., are within 25 miles of Rapid City. It was thought desirable to locate the School at some distance from the active mining region, rather than directly within it, for it is now realized in technical education that the teaching of the fundamental sciences must be thoroughly accomplished before their technical application can be considered. If the School were located directly within the bustle of the mines and mills, it is very probable that, to some extent, the extremely practical surroundings might interfere with proper methods of study of the preliminaries.

In the last two years of the course, many visits are made to the active mining districts for the purpose of a close study of the methods in vogue. It is the intention, within the next year or so, to establish a summer school of mining to last six to eight weeks, in order to give the student a still more practical acquaintance with mining and metallurgical methods.

The location of the School is very favorable for the study of Geology. The Black Hills have long been known to afford remarkable facilities for the field study of Geology, in that the rocks of practically all ages are exposed in the uplift of the Black Hills. The great eruptive districts of the northern Hills afford fine opportunities for this branch of Geologic study.

Close to the School, within a few hundred yards, is the pyritic smelting plant of the Standard Smelting Compay, which treats the ores from the surrounding districts. It smelts ores, collecting the values

into a matte which is shipped to other plants for refining. This plant affords the more advanced students in Metallurgy every facility for an intimate study of a very interesting process. The management of the plant extends every courtesy to the students of the School of Mines.

BUILDINGS AND EQUIPMENT

Buildings and Grounds

The buildings in which the work of the School is carried on are three in number: First, the original School of Mines building, a commodious brick structure, three stories in height, situated in the west part of the grounds, and at the present time devoted entirely to the Preparatory Department, in which students, found deficient in studies for entrance into the School of Mines, are properly prepared. It contains a large assembly room and class rooms for the study of languages, mathematics, history, and a laboratory for biology. It is heated throughout by steam, furnished from the central power plant, and is lighted by electricity.

In the center of the grounds is the main building of the School, a large brick structure, with native sandstone trimmings, three stories in height, built in two wings in the shape of a T. This building contains in the front wing, on the first floor, a large entrance hall, a Geological Museum, class rooms in Mathematics and English, the President's and the Registrar's offices. On the second floor are chemical laboratories, comprising the general, qualitive and quantitive laboratories, and offices and class rooms of the Department of Chemistry. The basement of the building contains the physical laboratory, store rooms and a lunch room. The first floor of the

rear wing of the main building contains the Library and the balance of the Department of Geology and Mineralogy, consisting of class rooms and offices, and a thoroughly equipped mineralogical laboratory. The second floor contains the Department of Engineering, consisting of instructor's offices, two large drawing rooms for the Freshmen and Sophomore classes respectively, a large lecture room, and a thorougly equipped room for making blue prints. In the basement of this wing is a well equipped machine shop and store rooms. The machine shop serves the purpose of enabling the School to make a very appreciable amount of apparatus for scientific work as the occasion for its construction arises.

East of the Main Building is the Metallurgical Laboratory Building, 138 feet by 60 feet in plan, two stories in height, built of red brick with stone trimmings. This building is devoted exclusively to the Department of Mining and Metallurgy. It contains, on the first floor, a large chemical laboratory for advanced metallurgical chemistry, a well equipped balance room, containing massive concrete piers for the mounting of balances, private chemical laboratory and supply room, assay laboratory and a large assay furnace room, In the rear of the assay furnace room is the metallurgical laboratory, containing mining and metallurgical machinery and apparatus.

On the second floor are located the lecture rooms of the Department of Mining and Metallurgy, offices of these departments, and a Mining and Metallurgical Museum.

On the east part of the school grounds is located the central heating plant, containing boilers, etc., which supply the three large buildings mentioned with heat, and the metallurgical laboratory with power. It is built of stone and has adjoining sheds with a large capacity for the storage of coal.

Equipment

In general, the School is well equipped to carry on its work. It has the essential of modern scientific technical instruction, ample laboratory facilities in all required branches.

Library

The libraries of the South Dakota State School of Mines are made up of a general library and the departmental libraries in Metallurgy, Mining, Geology, Chemistry, Engineering, Physics, Biology, English and History.

The general library and reading room occupy a large, well lighted and well equipped room on the first floor of the annex of the Main Building. Here are kept the reference books and others of a general nature, not bearing directly upon the work of any particular department.

Economics, History, Philosophy, Agriculture, and Literature are represented.

In this room is also placed a library of 400 volumes of a miscellaneous nature which the Rapid City Library Association loans the School.

On the reading tables are found the best journals on Mining, Metallurgy, Geology, Chemistry and Engineering, as well as magazines of a more general interest.

The following journals are on file:

Mining and Scientific Press.
Engineering-and Mining Journal.
Mines and Minerals.
Mining Reporter.
The Analyst.
Bulletins, American Institute of Mining Engineers.
Bulletins, Institution of Mining and Metallurgy.

Journal, Chemical, Metallurgical and Mining Society of South Africa.

Metallurgie.

Berg and Huetten-mannische Zeitung.

Economic Geology.

Bulletins, Geological Society of America.

Journal of Geology.

Engineering Magazine.

Journal, American Chemical Society.

American Chemical Journal.

Journal of the Society of Chemical Industry.

Electro-Chemical and Metallurgical Industry.

Mining World.

National Geographical Magazine.

Zeitschrift der Anorganischen Chemie.

Exchanges received from student publications.

The reference works contain, among others, complete or partial sets of bound volumes of the following publications:

Transactions American Institute of Mining Engineers.

Transactions Institution of Mining and Metallurgy.

Engineering and Mining Journal.

Mining Reporter.

Bulletins, Geological Society of America.

Journal, Chemical, Metallurgical and Mining Society of South Africa.

Journal of Geology.

American Geologist.

The Mineral Industry.

Bulletins of U. S. G. Survey and others.

The department libraries contain all of the chief books bearing directly upon the work of the respective departments. They are, for the most part, readily accessible to the student. The card system of cataloguing is in use.

Drawing Rooms

In the Department of Engineering are two large drawing rooms—one for Freshmen and Sophomore work, the other for Junior work.

The rooms are fitted with especially designed drawing desks, each desk containing lockers in which students take care of their supplies. The drawing rooms are well lighted by many windows. Adjoining the Freshmen drawing room is a large room for the making of blue prints. It contains the blue print machine, sliding on a frame in the window, with south exposure so that sunlight is available for the greater part of the day. A large sink for the washing of prints is provided.

Chemical Laboratories

There are three chemical laboratories—one for general chemistry, one for qualitative analysis, and one for quantitative analysis. The last two laboratories are equipped with large individual desks with tile tops, each desk being supplied with gas from the city mains. Between the desks are sinks with flowing water. Each student receives a separate and complete set of reagent bottles and supplies. The laboratories are well lighted and provided with ample hoods to carry off the fumes. The quantitative laboratory is equipped with a separate balance room in which are analytic balances of standard makes, among them Becker's and Troemner's.

The apparatus is ample for all mineral, alloy and rock analysis, and includes combustion furnaces, apparatus for gas analysis, and facilities for electrolytic precipitations.

Physical Laboratory

The Physical Laboratory is located in the basement of the annex of the Main Building, thus secur-

ing absolutely stable foundations for such apparatus and instruments as require it.

The laboratory is thoroughly equipped with the ordinary physical apparatus, such as balances, Atwood machine, hydrometers, specific gravity apparatus, spectroscopes, apparatus for the measurement of light, calorimeters, electrical apparatus, such as the Wheatstone bridge, voltmeters, ammeters, galvanometers, engine indicators, etc.

For electrical experimentation, dynamo and motors are available.

Assay Laboratory

The Assay Laboratory is very modern in its appointments. It has, within the last year, been completely remodeled. It contains a room in which the students are provided with individual desks; pulp balances for the mixing of assay charges; a balance room provided with concrete foundation piers; the pulp room in which ore samples, etc., are crushed and sampled, and the furnace room in which furnace work is done exclusively. This furnace room contains five double muffle-furnaces, heated by soft coal.

They are placed in openings in a heavy dividing wall, separating the machinery hall from the front part of the building. In this way the front of the furnaces with the muffle openings are in the furnace room, flush with the wall, while the firing and taking out of the ashes is done on the other side of the wall, thus avoiding the dust and dirt where it is very undesirable. The furnace room is fire-proof. There is a melting furnace using coke; also gasoline furnaces made by Braun & Company, San Francisco.

The balance room is provided with Ainsworth, Eimer & Amend, Thompson, and Keller balances. In the pulp room an electric motor furnishes power for the small Gates sample crusher and

a sample grinder. A Calkins automatic cupel machine is used for the making of cupels. A large number of ore samples are kept on hand. Ores from all parts of this country are provided in great variety. The nearness of a smelter and mills makes it comparatively easy to procure many types of furnace products, such as mattes, flue dust, fume and umpire samples for close checking work.

Metallurgical Laboratory

The metallurgical laboratory contains machinery and apparatus, mainly illustrative of that used in the metallurgy of lead and copper, gold and silver. There is a 30-inch water-jacket furnace, a small Bruckner roasting furnace, a Baker blower, a Gyratory crusher, two sets of rolls, a wet crushing stamp battery equipped with automatic feeds, amalgamated copper tables, a Wilfley table, two grinding pans, a tube mill, sizing screens, hydraulic classifiers, jigs, a cyanide leaching plant and a slimes filtering plant. Most of it is used frequently in the work of the laboratory. Power is furnished by electric motors.

Scientific metallurgicial apparatus, consisting of metallographic microscopes, pyrometers, electric resistance furnaces, apparatus for gas analysis, etc., are available for frequent use. A special laboratory is provided in the Metallurgical Building, devoted to metallurgic analysis and research. Students carrying on thesis work in metallurgy have desks in this laboratory.

Mineralogical Laboratory

This is a large room well equipped with low tables arranged for the study and determanation of minerals. Students are provided with the necessary reagents and apparatus by the department, upon the payment of a small fee. Each student has his

own locker. A large working collection of carefully labeled minerals availble for students use is kept in specially designed cases ready of access, and and a considerable collection of unknown minerals is at hand for determination.

Geological Museum

The museum is an important feature in the equipment of the School of Mines. Its contents have been chosen to assist in the teaching of geology, mineralogy, petrography and paleontology, rather than to become a store house of curiosities. The room is thirty-six by forty-seven feet in size and lighted by ten large windows.

Two kinds of cases are used for the display of specimens—central cases and wall cases. There are eight central cases, each consisting of two parts of three compartments each, with glazed tops, and a six compartment massive base; the whole constructed in such manner as to serve practically as two sections, fitting tightly, back to back. The display surface, under glass, is nearly fifty feet square for each case. The bases are especially designed for the storage of material not needed for constant exhibition. The cases are of oak,

The wall cases are finished in pine and have glazed doors. Each is seven feet six inches high and contains three double-door compartments of six shelves. The cases are particularly adapted for the display of large specimens.

Cases one and two contain a general collection of minerals arranged according to Dana's system of classification. Cases three and four contain series of specimens to illustrate general features of mineralogy, geology and petrography. Case five contains a collection of well preserved fossils, carefully selected to show the more prominent features of

paleontological interest. Case six contains representative collections of Black Hills ores and rocks. Case seven contains Cretaceous and Tertiary fossils from the Black Hills region, mainly from the Cheyenne river and the White river Bad Lands. Case eight contains a good collection of Black Hills minerals.

The wall cases are for large specimens of all classes, some of which are very beautiful. The collection from the Black Hills is especially noteworthy and is very rich in the rare minerals of the region, as for instance, lepidolite, wolframite, columbite, amblygonite, etc.

The museum contains two large topographic maps of the Black Hills made for the St. Louis Exposition.

The museum has also recently been enriched by the gift of a very valuable and unique rock section of the Homestake Mine, donated by the Homestake Mining Company of Lead, South Dakota

The collection of minerals exhibited by the School at the St. Louis Exposition, 1904, received a diploma and gold medal.

Mining and Metallurgical Museum

This is situated on the second floor of the Metallurgical Building, in a large, well lighted room and contains wall cases for the display of specimens. It has a fair collection of furnace products, such as slags, mattes, etc., wall boards of hoisting ropes and screens, and similar materials. In time it will become a valuable adjunct to the teaching of mining and metallurgical subjects. It is constantly being added to by the kindness of the manufacturers and mining companies, who donate exhibits. The School is always very grateful for donations of this kind and makes due acknowledgment for the same.

Shops

In the basement of the Main Building a large workshop is provided, containing a machine lathe, planers, drill press, other machinery and many tools. Occasion often arise for the design and construction of certain pieces of apparatus for different departments, especially those of Metallurgy, Mining, Physics, and Chemistry.

Many pieces of apparatus have been constructed in this shop which would have cost the School considerable sums of money. The students of the upper classes are granted permission to use the facilities offered by the shop, whenever occasion arise to do so, in their work.

PUBLICATIONS

Bulletin No. 1—Preliminary Report of the Dakota School of Mines upon the Geology, Mineral, Resources and Mills of the Black Hills of Dakota; 171 pages. 1888 (Out of print.)

By F. R. Carpenter and H. O. Hofman.

Bulletin No. 2.—Notes on the Geology and Mineral Deposits of a Portion of the Southern Black Hills; 41 pages, Department of Geology. 1899.

By C. C. O'Harra and A. Forsyth.

Bulletin No. 3.—Cyanide Experiments on the Silicious Ores of the Northern Black Hills, etc.; 27 pages; Department of Metallurgy. 1900.

By A. Forsyth and G. H. Clevenger.

Bulletin No. 4.—History of the Early Explorations, etc., in the Black Hills, and Bibliography of Contributions to the Geology of the Black Hills Region; 88 pages; Department of Geology. 1900.

By C. C. O'Harra.

Bulletin No. 5. — The Cyanide Process in the Black Hills of South Dakota; 88 pages; Department of Metallurgy. 1902.

By C. H. Fulton

Bulletin No. 6. — The Mineral Wealth of the Black Hills ; 88 pages ; Department of Geology. 1902.

By C. C. O'Harra.

Bulletin No. 7.—Metallurgical Practice in the Black Hills of South Dakota ; 63 pages ; Department of Metallurgy. 1904.

By C. H. Fulton.

Bulletin No. 8.—The Cement Resources of the Black Hills. (In press.)

Bulletin No. 9.— Annual Catalog : Descriptive of the Courses Given by the School, and Containing General Information.

Bulletin No. 10. — Announcements containing information about the School, issued regularly.

The publications of the School may be had, free of charge, by addressing the President.

STUDENTS' EXPENSES

Tuition

The tuition and incidental fee is $6 per semester or $12 per year. payable in advance on registration. This fee is the same to residents and to non-residents of the state.

According to Section 209 of the Political Code, 1903, page 40 ;

"The regents shall fix all rates of tuition and other fees, to be paid by students, but such rates shall be the same in all the different institutions. They may receive, in any one of the institutions under their control, free of tuition, two students, appointed by each State Senator, and one by each Rep-

resentative of the State Legislature, which appointees shall be residents of their respective districts or counties, and whose term shall expire with the term of office of said Senator or Representative, provided that such appointees shall comply with all the rules and requirements of the institution which they desire to enter. No student, however, shall receive any other gratuity whatever.

Fees

Fees enumerated below cover the bare cost of materials and supplies consumed in the laboratories and loss due to breakage, etc.

All fees are payable at the beginning of each semester, on registration. (Consult Departments of Instruction for description of courses.)

Chemistry 1, Elementary Chemistry	$ 4 per semester
Chemistry 6, Qualitative Analysis	7 per semester
Chemistry 7, Quantitative "	8 per semester
Chemistry 8, Metallurgical Analysis	8 per semester
Metallurgy 6, Assaying	25
Metallurgy 7, Metallurgical Laboratory	5 per semester
Mineralogy 1, General Mineralogy	5 per semester
Mineralogy 2, Blow-pipe Analysis	5 per semester
Geology 3, Petrography	2 per semester
Physics, 2, Elementary Physics	1 per semester
Physics 4, Advanced Physics	2 per semester
Engineering 7, Surveying	3 per semester
Engineering 3, Mechanical Drawing	1 per year
Engineering 5, Mechanical Drawing	1 per year
Preparatory Science, Biology	2 per semester

Chemistry, 1, 6, 7 and 8 deposit to cover breakage, etc.	5
Metallurgy 6, deposit to cover breakage	3
Metallurgy 7, deposit to cover breakage	3
Fee for bachelor's degree	5
Fee for advanced degree	10
Athletic Association Fee	2 per year

(Note.—No platinum is furnished by the Department of Chemistry.)

Other Expenses of the Nature of Fees

The Department of Engineering furnishes supplies for the mechanical drawing courses, practically at cost.

Engineering 1, Mechanical Drawing, will cost approximately, $7 for the year, exclusive of drawing instruments, which the student purchases on his own account, prices ranging from $13 up for a good set of instruments.

Engineering 3, Mechanical Drawing, will cost approximately $4 for the year.

Engineering 5, Mechanical Drawing, will cost $2.50 for the year.

Living Expenses

Board and room may be obtained in town with private families or in boarding houses or hotels, at rates varying from $20 to $30 per month, according to accommodation; $25 per month is a fair average and will insure good board and room. Rooms only may be obtained for from $5 to $10 per month, and table board for from $4 upward, per week. This makes the expense for board and room for the school year of 37 weeks range from $185 to $275, according to location and accommodation.

Expenses for laundry and incidentals vary with the individual. The average for laundry expense is about $20 for the school year.

Cost of Text Books

Freshman year	$13.00
Sophomore year	17.00
Junior year	23.00
Senior year	19.00

Incidental Expenses.

Students are required, at various times, to take part in the geological, mining and metallurgical trips undertaken into the Black Hills mining district. The geological trip of the Freshman year usually costs the student about $10. Trips in the Junior and the Senior year, for mining and metallurgical exploration, cost a similar sum; so that the student should figure on a cost of from $30 to $40 at least, for expenses of this kind during his four years' course at the school.

Total cost, including living, fees, books, incidental expenses, etc.:

Freshman year	$280 to $380
Sophomore year	275 to 370
Junior year	320 to 430
Senior year	290 to 385

This estimate does not include expenses incurred outside of school. A certain sum for this purpose should be added according to individual taste.

Opportunity for Self Help.

Opportunity for self help in town of the size of Rapid City is necessarily limited. It is also to be borne in mind that the course of study is an arduous

one and requires the student's best effort, and if conscientiously and satisfactorily performed, will leave comparatively little outside time in which to earn funds.

Some students find employment which nets them their board and lodging by doing chores in private families or assisting in some of the stores. Some find employment in the boarding houses. The School is able to assist Junior and Senior students, to some extent, by employing them in the capacity of assistant janitors and similar work.

Students who have become acquainted, by a residence in town for a year or two, find it easier to obtain help than strangers. For this reason it is essential that a student who comes as a stranger to enter the School, should be provided with sufficient funds to carry him through the first year, at the very least.

STUDENT ORGANIZATIONS AND ATHLETICS

The student organizations are: The Students' Association and The Athletic Association. The Students' Association has for its aim the general welfare of the student body. The Athletic Association has for its aim the furtherance of legitimate athletics, and maintains football and baseball teams and track athletics. Membership in this association is obligatory, all students paying the annual fee of two dollars. The association maintains baseball, football, and tennis, grounds. The School encourages athletics within reasonable limits, in so far as they do not interfere with the work of the school. The "Triangle Club" is a literary Association.

CONDUCT

The School has no codified rules of conduct. Students are held to a strict account of their work and are expected to fulfill their inheritance as gentlemen. Failure to live up to the requirements is considered a sufficient cause for severing their connection with the School.

DETERMINATIONS OF MINERALS AND ASSAYING

Minerals are determined free of charge. Samples for determination should be addressed to the Department of Geology, State School of Mines, Rapid City. Assays for gold and silver, etc., and chemical analysis, both quantitative and qualitative, are made at a reasonable rate. Prices will be sent upon application to the Department of Metallurgy. All samples for analysis and assay should be addressed to this department.

REQUIREMENTS FOR ADMISSION

Freshman Class

Requirements for admission to the Freshman class of the Mining Engineering course are as follows:

Fourteen units are necessary for entrance.

Required Units

Arithmetic	1	unit
Algebra	1.5	units
Plane Geometry	1	unit
Solid Geometry	0.5	unit
English	2	units
History	1	unit
Physics	1	unit
Chemistry	1	unit
Total required units	9	

Elective Units

German	1, 2 or 3 units
French	1, 2 or 3 units
Latin	2, 3 or 4 units
Greek	1 unit
Spanish	1 or 2 units
English	1 or 2 units
History	1 or 2 units
Mathematics	0.5 unit
Science	1 or 2 units
Drawing	1 unit
Shop Work	1 unit
Civil Government	0. 5 unit
Bookkeeping	1 unit

Elective units required for entrance, 5.

A unit course of study is defined as a course covering a school year of not less than 35 weeks with 5 periods of at least 45 minutes each per week.

Method of Entering the School

First: By certificate. Graduates of accredited High schools in the State of South Dakota and other states will be provisionally admitted without examination, if they present proper credentials, certifying to the fact that they have completed the studies mentioned under the requirements for admission.

Second: By examination. All other candidates for admission to the regular mining engineering course will be required to pass entrance examinations in the subjects specified. These examinations are held at Rapid City, on dates mentioned in the calendar. Students who are deficient in subjects required for entrance into the regular mining engineering course are permitted to enter the Preparatory Department, maintained by the School for the special purpose of preparing students so deficient.

Credentials for entrance should be in the hands of the President on or before the date set in the calendar for the examination of credentials by the committee on admission.

Application for admission blanks will be sent upon request.

Description of Units Required for Entrance

Required units:

Mathematics—The four and one-half units which may be offered in mathematics are as follows:

Arithmetic—One unit, complete, including the metric system.

Algebra—One and one-half units. The equivalent of A, B and C algebra described under Preparatory Mathematics in the Preparatory Catalogue.

Plane Geometry—One unit. The equivalent of plane geometry described under Preparatory Mathematics.

Solid Geometry—One-half unit. The equivalent of solid geometry described under Preparatory Mathematics.

English—Two units. The equivalent of English 1 and 2 described under Preparatory English and other courses described in that department.

Physics—One unit. The equivalent of physics described under Preparatory Physics in the Preparatory Catalog.

Chemistry—One unit. The equivalent of elementary chemistry described in the Preparatory Catalog.

History—One unit. The History of the United States, English or Ancient History, as described under History, in the Preparatory Catalog.

Elective Units

The equivalent of courses, not mentioned above, described under Mathematics (trigonometry only.) Languages, History, English and Preparatory Science, in the Preparatory Catalog.

Special Students

Applicants for admission, who are graduates of colleges or technical schools will be admitted as special students and permitted to take any subject they desire, taught in connection with the regular courses. Persons of mature age, who have been employed in mines and metallurgical plants and who desire to take up special courses, particularly along the lines of mining, metallurgy and geology, will be admitted as special students, provided they show that they have sufficient foundation to take up the work with profit to themselves. No immature persons will be permitted to enter the School to take advanced courses, such as Assaying, Metallurgy, etc.

Admission to Advanced Standing

Graduates of colleges and technical schools who enter the School as candidates for a degree will receive proper credit for all such studies which they have completed and which form part of the curriculum of the School of Mines. The faculty decides these cases upon the basis of individual merit.

DEGREES

The School of Mines offers two degrees: That of Bachelor of Science in Mining Engineering, to the candidate who has successfully completed the regular Mining Engineering course, and that of Bachelor of Science in Metallurgical Engineering, to the candidate who completed successfully the metallurgical option of the Mining Engineering course.

The degree of Engineer of Mines, or of Metallurgical Engineer, will be conferred upon graduates of the Engineering course of the School, who shall have devoted one year to graduate study in the School of Mines, under the direction of the faculty, passing required examinations upon the studies pursued, or to those who shall furnish suitable evidence of two years' successful experience in mining or metallurgical work.

Students who complete the studies in the Preparatory Department will receive, therefor, the usual diploma.

THESIS

Every candidate for a degree in the regular Mining Engineering course or in the Metallurgical option of that course is required to present a thesis on some mining, metallurgical, or geological subject before he *will* receive his degree. The candidate for a degree should make a choice of subject and submit it to the faculty for approval not later than October first of the senior year. If no choice is made by that time the faculty will assign a subject. After the choice of the thesis, the candidate for the degree should confer concerning it with the professor in charge of the department within which it naturally falls.

Theses must be submitted to the faculty not later than May 15, and must be typewritten on paper 8.5 by 11 inches in size. Two copies must be furnished; one for the department within which the thesis falls and one for the library. No degrees will be granted unless the conditions concerning thesis are fully satisfied.

COURSES AND DEPARTMENTS.

The courses given by the School of Mines are:

First—Mining Engineering Course.....4 years

Second—Mining Engineering Course, Metallurgical Option.....4 years

SYNOPSIS OF COURSES

MINING ENGINEERING COURSE.

Freshman Year

First Semester—	Lecture Periods	Laboratory Hours
Mathematics 7, Trigonometry	5	
Chemistry 2, General Chemistry	3	
Chemistry 3, 6, Qualitative Analysis	2	9
Geology 1, General Geology	4	3
Engineering 1, Mechanical Drawing		6
English 5, Composition 5	3	
Second Semester—		
Mathematics 8, Analytic Geometry	5	
Chemistry 2, General Chemistry	3	
Chemistry 3, 6, Qualitative Analysis	2	9
Geology 1, General Geology	4	3
Engineering 1, Mechanical Drawing		6
English 5, Composition 5	3	

Sophomore Year

First Semester—		
Mathematics 9, Calculus	5	
Physics 3, 4, Advanced Physics	2	3
Chemistry 4, 7, Quantitative Analysis	2	9
Mineralogy 1, General Mineralogy	3	3
Engineering 3, Mechanical Drawing		6
Engineering 2, Descriptive Geometry	1	
English 6, Composition 6	2	

Second Semester—	Lecture Hours	Laboratory Hours
Mathematics 10, Calculus	5	
Physics 3, 4, Advanced Physics	2	3
Chemistry 4, 7, Quantitative Analysis	2	9
Mineralogy 2, Blowpipe Analysis	1	6
Engineering 4, Mechanism	2	
Engineering 2, Descriptive Geometry	1	
Engineering 3, Mechanical Drawing		6

Junior Year

First Semester—		
Engineering 7, Surveying	3	9
Geology 2, Physical Geology, or Chemistry 5, 8	3	3
Mathematics 11, Mechanics	5	
Mining 1, Boring, etc.	3	
Mining 8, Ore Dressing	3	
Engineering 6, Graphics	1	3
Engineering 5, Mechanical Drawing		6

Second Semester—		
Engineering 7, Surveying	2	9
Geology 3, Petrography, or Chemistry 5, 8	3	3
Engineering 11, Resistance of Materials	5	
Mining 2, Tunneling, Shaft Sinking	3	
Metallurgy 1, General Metallurgy	3	
Metallurgy 6, Assaying	2	9

Senior Year

First Semester—		
Mining 3, Hoisting, Transportation, etc.	5	
Metallurgy 2, 3, 7, Iron and Steel, Copper and Lead	5	6

	Lecture Period	Laboratory Hours
Geology 4, Economic Geology, or Metallurgy 5, 8	4	
Engineering 8, 9, Hydraulics and Thermo-Dynamics	4	
Mining 6, Design of Mine Plant		6
Mining 5, Mine Accounting		3
Thesis		3
Second Semester—		
Mining 4, Drainage, Ventilation, etc.	5	
Metallurgy 4, 7, Metallurgy of Gold and Silver	5	3
Geology 4, Economic Geology, or Metallurgy 5. 8	4	
Engineering 8, 10, Hydraulics, Power Plant	4	3
Mining 6, Design of Mine Plant		6
Mining 7, Mining Law	1	
Thesis		6

NOTE: Fifty minutes constitute a lecture period and sixty minutes a laboratory hour.

DEPARTMENTS OF INSTRUCTION

DEPARTMENT OF MINING

PROFESSOR EHLE

The instruction in Mining is given by lecture courses, illustrated by lantern views, photographs and drawings; by frequent references to standard works and current literature; by experimental work on various types of ores, carried on in the mining laboratory, and by excursions to near-by mines and mills for the purpose of observing and noting actual conditions of practice.

The department enjoys, to an unusual degree, those advantages which naturally accrue from the

School's location. Being contiguous to a world famous mining region, the nearness of large producing mines means much, while the wholesome mining atmosphere in whlch the student lives, furnishes a never failing supply of food for enthusiasm and interest.

The mining and metallurgical laboratory of the School, which has proven a most valuable adjunct to the work of instruction, has been completely overhauled and re-equipped with modern appliances of approved design. The various operations attendant upon the preliminary treatment of various types of ore will here be carried out by the students, on a scale approaching commercial practice.

It is the intention of the department to inaugurate, during the early part of the summer vacation of 1908, a Summer School of Mining, which shall henceforward constitute a regular annual feature of the work, and attendance upon which shall be obligatory with all regular members of the Junior class. A suitable mining locality having been decided upon, the students, under the direction of instructors, will spend from two to three weeks in the careful study of practical mining, both above and below ground; careful and systematic note taking and sketching of all the principal features being a requirement.

The uniform courtesy and good will shown by the management of mining enterprises throughout the region, to instructors and students, indicates a wholesome regard for the efforts of the department and constitutes one of its most valuable assets.

The following courses of study are offered by the department:

Mining 1

Borings: The use of the earth auger, drive pipe, etc., in the boring of holes for wells and for prospecting purposes; the boring of deep holes by the churn drill or drop tool; also by the diamond and other rotary drills; the survey of bore holes; the cost of boring.

Breaking Ground: The excavation of earth and rock in general; hand tools; mechanical earth excavators; rock drills and drilling; channelers; coal cutters; steam shovels; dredges; etc.; estimates and costs of excayations.

Explosives: Black powder, nitro-glycerine, gun cotton, and their derivatives; methods of testing, and calculation of heat and pressure developed; pointing and charging of holes; methods of firing; costs of blasting operations.

Junior Year, First Semester: Three lecture periods per week.

Mining 2

Tunneling: The driving of mine tunnels and drifts through rock and through soft or running ground; comparative cost; general discussion of the methods used in driving large tunnels for railroad or other purposes.

Shaft Sinking: The sinking of shafts for mining purposes through soil, rock, quicksand and other water bearing strata, by approved methods; costs of same.

Supporting Excavations: The use of wood, metal and masonry in the lining of shafts and other excavations, their relative cost, strength and durability; the timbering of stopes, stations, and other working places underground; the preservation of timber.

Junior Year, Second September: Three lecture periods per week.

Mining 3

Exploitation: The extraction of mineral by open works; by wells and bore holes; the underground working of veins, bedded deposits, and masses, by methods best suited by each; conditions affecting the choice of methods; costs of ore extraction.

Transportation: Underground and surface; vehicles and motive powers; self acting and engine planes; haulage by the trail rope and by the endless rope system; electric and compressed air haulage, surface tramways and aerial rope-ways.

Hoisting: Hoisting engines, their construction and chief features; methods of equalizing the load moment of the engine; ropes, cages, skips and safety appliances; gallow frames; pneumatic hoisting; costs.

Senior Year, First September: Five lecture periods per week.

Mining 4

Drainage: Sources of mine water; dams and drainage levels; hoisting of water; direct acting and Cornish pumps; use of compressed air and electricity in pumping operations; special devices; examples and costs.

Ventilation and Lighting: Natural and induced ventilation; furnaces and fans; friction of air in mines; control of air currents; efficiency of ventilating apparatus; the use of candles; open lights, safety lamps and the electric light in undergound illumination.

Hygienic Conditions: Surface arrangements for the comfort and convenience of the miner; ascent and descent by ladders, cage or man engine, and relative economy of different methods; accidents, their causes and prevention; rescue and relief of men; mine fires.

Administration: Business management and the principles of employment of labor; organization of mine staff.

Mine Examination: Sampling of ore bodies; estimation of "ore in sight," and the valuation of mining properties; forms of report.

Placer Mining: Sluices, riffles, pipe lines, nozzles and hydraulic elevators, their construction and use; river dredging; costs and results.

Senior Year, Second Semester: Five lecture periods per week.

Mining 5

MR. HUMBERT.

Mine Accounting: Organization of corporations and stock companies, with particular reference to mining and metallurgical companies; discussion of system of mine and mill accounting; keeping accounts with different departments; derivation of cost sheets, etc.; accounts of smelting and milling plants, yard books, furnace records, ore books, smelting records, etc. General methods of business; buying and selling ores; labor, etc.; organization of the staff of a mining and metallurgical company.

Senior Year, Second Semester: Three laboratory hours per week.

Mining 6

Design of Mine Plant: The student is given certain data, relative to a hypothetical mine, such as

maximum depth of hoist, capacity, speed of hoisting, etc., from which he calculates the power needed, selects the type and size of hoisting engines, makes calculations as to the size of reel for flat rope, and drums of different forms, such as to give the best results in the equalization of moment on the engine. He then calculates and designs the gallows frame and shaft house, also such features as ore bins, mine car, cage, skip, etc.

Senior Year, six laboratory hours per week throughout the year.

Mining 7

Mr. C. L. Lewis.

Mining Law: During the year Judge C. L. Lewis will deliver a series of lectures before the members of the Senior class, in which he will discuss and exhaustively review the general mining laws with reference to the public lands, embracing, among others the following topics: The early history of mining prior to the enactment of the General Mining Law of Congress; the General Mining Laws of the United States and Territories; Mining Districts, their origin, how organized, and the customs, rules and regulations of miners; lands subject to location and who can locate; the proper location of lode claims; the proper location of placer claims; patent proceedings; timber and stone lands in the mining states, and special laws applicable thereto.

Senior Year, Second Semester: one lecture period per week, fifteen weeks.

Mining 8

Ore Dressing: The principles of ore crushing, description of the various types of crushing machin-

ery; screens and the principles of screen sizing; the theory and practical application of the dressing of ores by water currents, including descriptions of the principal forms of classifiers; jigs and the laws of jigging; slime treatment, and the machinery for its accomplishment; general discussion of the Continental and English systems of ore dressing, and their American modifications; magnetic concentration; concentration by oil; dry concentration; the description and study of typical ore dressing mills.

Junior Year, First Semester: Three lecture periods per week.

DEPARTMENT OF METALLURGY

Professor Fulton. Mr. Anderson.

Mr. Marshall.

Metallurgical subjects are taught by lecture courses with frequent reference to standard works on the subject, and to the current literature.

This work is supplemented, as far as possible, by laboratory testing and experiments and by excursions to neighboring metallurgical works. The School is favorably situated, being contiguous to an an active gold mining district, the Black Hills, affording an unparalleled opportunity to study the practical side of metallurgy, particularly that of gold, on a large scale and at close range.

The stamp mills, cyanide plants. and smelter, of Lawrence county are easily reached by rail in a few hours' time, while close to the School is the pyrite smelting plant of the Standard Smelting Company to which students have access for the purposes of study.

A well equipped metallurgical laboratory is available for use, as it is desirable that the student should be thoroughly trained in the basic scientific principles of metallurgy. With actual metallurgical operations, on a large scale, the student becomes familiar to such an extent as is desirable during his school years, by the frequent visits to the working plants of the district.

In the laboratory, he becomes thoroughly acquainted with the use of pyrometers, calorimeters, microscopes for the examination of metals and furnace products; close and scientific experiments with the refining and heat treatment of steel, electric deposition of metals, formation of slags, refining of metals, cyanide process and amalgamation, etc., as well as to some extent with the actual working of a furnace, stamp mill, concentrating tables, with which the laboratory is provided.

The department is also equipped with a card index of metallurgical literature, which covers all of the subjects of interest very completely, and is at the service of students.

Metallurgy 1

General Metallurgy: This course consists of lectures on the physical properties of metals; on alloys, their types, nature, and properties; fuels; refractory materials; thermal measurements; discussion of metallurgical principles; slags and furnace products, and their nature; types of furnaces and furnace construction; the means of supplying and heating blast; thermo-chemistry, including a discussion of chemistry at high temperatures; typical metallurgical processes, and the general economic considerations of metallurgy, such as buying and selling of ores and metallurgical products. Students

are required to do outside reading from references given in the class room, and hand in for examination papers on topics assigned. Laboratory work covering part of this course is carried out in the Senior year, and is described under Metallurgy 7.

Junior Year, Second Semester: Three lecture periods per week.

No text book required. Chief reference work, Roberts-Austen, Introduction to the Study of Metallurgy.

Metallurgy 2

Iron, Steel and Other Alloys: This course consists of lectures on alloys, their classification, structure, properties, metallography; taking up more particularly iron and steel. The hardening and tempering of steel is taken up in detail. The metallurgy of cast iron, wrought iron and steel is discussed in principle, but not in great detail. Especial attention is paid to the principles and chemistry of the iron blast furnace and to the Acid Bessemer process, and to the Acid and Basic Open Hearth process. Statistics of the iron and steel industry are given. The student is required to do considerable outside reading. Laboratory work in connection with this course is described under Metallurgy 7.

Senior Year, First Semester, seven weeks: Five lecture periods per week.

Text book: Howe s Iron, Steel and Other Alloys.

Metallurgy 3

The Metallurgy of Copper and Lead: This course consists of lectures on the modern metallurgy of copper and lead. It discusses the types of copper

and lead ores and the methods suitable for the treatment of the different types. The principles of the reverberatory process for copper are disscussed in detail, as it brings out clearly the chemistry of copper. Matte smelting for copper ores is discussed, both pyrite smelting and ordinary matte smelting being taken up in detail; also the roasting of copper ores. This is followed by the discussion of the Bessemerizing of copper mattes and the electrolytic refining of blister copper. Wet methods for copper ores are discussed. This is followed by a discussion of the blast furnace smelting of lead ores, including the roasting of ores, composition of lead slags, the products of the furnace, etc. The practice of large centrally located plants, treating both mixed lead and copper ores is taken up; also the reverberatory smelting of lead ores and the desilverization of lead ores and the desilverization of lead bullion and the refining of lead. Laboratory work for this course is described under Metallurgy 7.

Senior Year, First Semester, eight weeks: Five lecture periods per week.

No text book required. Reference works: Hofman's Metallurgy of Lead; Peters' Metallurgy of Copper; Ile's Lead Smelting; Schnabel's Handbook of Metallurgy; Peters' Principles of Copper Smelting.

Metallurgy 4

The Metallurgy of Gold and Silver: This course consists of lectures on the metallurgy of gold-silver, taking up, first, modern stamp mill practice; discussing in detail, mortarboxes, stamps, screens, general battery construction, etc., and the influence of weight of stamp, screen mesh, mortar box dimensions, amount of water on results obtained. Inside

and outside amalgamation is taken up in detail; the general mill arrangements; clean up; the influence of other processes following amalgamation is discussed. Modern fine grinding in tube mills and other apparatus is taken up. This is followed by a discussion of the cyanide process for gold and silver ores; wet and dry crushing; crushing in cyanide solution; the separation of sands from slimes; the treatment of sands by percolation; the treatment of slimes by decantation, filter pressing and vacuum filtration; the precipitation of gold and silver by the various methods in use; methods of cleaning up and the smelting of cyanide precipitates. The general chemistry of cyanidation and the proper performance of laboratory experiments is discussed. This is followed by lectures on the chlorination process, particularly on the roasting of gold ores both for chlorination and cyanidation; the chloridizing roasting of silver ores; pan amalgamation; leaching process for silver ores, etc., concludes the course. Laboratory work for this course is described under Metallurgy 7.

Senior Year, Second Semester, thirteen weeks: Five lecture periods per week. The remaining two weeks are given to a brief discussion of the metallurgy of zinc.

No text books required. Reference works; Julian & Smart's Cyaniding of Gold and Silver Ores; T. A. Richard's Stamp Milling of Gold Ores; Henry Louis' Handbook of Gold Milling.

Metallurgy 5

This is a course discussing in greater detail some of the features of Metallurgy 1. It comprises lectures on the physics and chemistry at high temperatures; pyrometry, including a discussion of the

principles of the measurements of high temperatures by different methods; calorimetry, including the determination of calorific power of fuels, and the specific heats of slags, etc., and work in Metallography The laboratory work for this course is described under Metallurgy 8.

Senior Year: Four lecture periods per week throughout the year.

(Note: Course 5 is a metallurgic option replacing Geology 4, in the regular mining engineering course. If the majority of the students who elect this work so desire, Course 5, instead of being as above will be replaced by lectures, dealing in detail with the metallurgy of gold, chiefly amalgamation and cyanidation, similar to Course 4, but greatly enlarged in detail and usefulness.)

No text book required. Reference works: Le-Chatelier & Boudouard's High Temperature Measurements; J. H. Vogt's Silicat-Schmelz Losungen, etc., Volumes of the Metallographist, and other works.

Metallurgy 6

Assaying: This course is taught by lectures and by laboratory work, based on the lectures. Elementary chemistry, qualitative and quantitative analysis are pre-requisites, being necessary for a thorough understanding of the work.

The work in the laboratory includes assaying of reagents; the testing of ores to discover their nature; the study of oxidizing and reducing reactions occurring in assaying; the study of typical assay slags; the assaying of pure gold and silver ores by crucible and scorification methods; the special assaying of copper and zinc ores containing gold and silver; the assaying

of arsenical and antimonial ores for gold and silver; the study of cupellation and the factors which influence its results; the assaying of impure ores by the roasting, the nitre, and the excess litharge methods; the assaying of telluride ores, lead bullion, and cyanide precipitates for gold and silver; the assaying of gold and silver bullion; the assaying of ores and alloys for platinum, iridium, etc.; the assaying of lead, tin, bismuth, and antimony ores for their respective base metals; the dry assay of mercury ores for mercury, and concentration and free milling tests on a laboratory scale.

Junior Year, Second Semester: Two lecture periods and nine laboratory hours per week.

Text book: Fulton's Manual of Fire Assaying.

Metallurgy 7

Metallurgical Laboratory: Laboratory practice in pyrometry; the calibration of the thermo couple; taking of cooling curves and freezing point curves; heat curves of furnaces; the examination of iron and steel and other alloys under the microscope; the preparation of metal sections for the microscope; the roasting of ores, noting the formation of sulphates, etc.; the desilverization of lead buillion by means of zinc; the electrolytic deposition of copper and lead; the roasting of gold and silver ores; experiments with the cyanide process, including the titration of pure and mill solutions with silver nitrate, analysis of cyanide solutions, cyanide experiments with small lots of ore in the laboratory to determine extraction, etc.; finally, at the end of the term, a mill run or smelter run on a large lot of ore.

Senior Year: First semester, six laboratory hours per week; second semester, three laboratory hours per week.

Text book: Clennell's Chemistry of Cyanide Solutions, and Howe's Laboratory Note Book.

Metallurgy 8

Metallurgical Laboratory: Laboratory practice in pyrometry, much more detailed than described for Course 7, including other pyrometers than the thermo couple; determination of calorific power of fuels by the bomb calorimeter; determination of the physical constants of slags, including their specific heat, melting points; microscopic examination of slags, mattes and other furnace products; the working out of metallurgical problems which may suggest themselves.

Senior Year: Three laboratory hours per week throughout the year.

Note: The note applying to Course 5 applies here also. The work of this course is accepted in part as thesis work.

Metallurgy 9

Metallurgical Thesis: Subject assigned by the professor in charge or chosen by the student.

Senior Year: First semester, three laboratory hours per week; second semester, six laboratory hours per week.

DEPARTMENT OF GEOLOGY AND MINERALOGY

Professor O'Hara Mr. Cooledge

Library, Laboratory and Field Facilities

A good, well equipped departmental library is placed convenient to the lecture and laboratory rooms and students are required to make intelligent use of the literature contained therein.

The laboratory equipment and the museum collections, elsewhere described, furnish indispensable material for practical work of many kinds.

Field facilities are unsurpassed. Unusual opportunity is afforded for study in the field of the various geological horizons, including important and valuable economic deposits. Within a few miles of the School the student may observe upturned strata of nearly all geological ages. Twenty miles southwest of Rapid City is the Harney Peak granite area, with its lavish variety of mineral specimens. Surrounding this is a wonderful exposure of Algonkian metamorphic rocks cut in many places by auriferous quartz veins. The Cambrian, Carboniferous, Triassic, Jurassic, and Cretaceous are extensively developed. The famous White River Bad Lands of Tertiary age lie to the southeast of the Hills and afford fossils which have made the region known wherever the science of Paleontology is taught In the northern part of the Hills important igneous rocks, such as rhyolite, phonolite, andesite, dacite, etc., occur in the form of dikes, sheets and laccoliths. Closely associated with these in slates, quartzites, and limestones, gold ores of the greatest importance are found.

In the autumn, short field excursions are made by the class to near-by points of interest and occasionally a visit of several days is made to more distant localities. Thus the student, in addition to lecture and laboratory instruction, has the advantage of systematically directed field study and with the information thus gained, he should be able to undertake for himself the working out of practical field problems.

Geology 1

General Geology: This course is arranged primarily as introductory to all work in geology and

mineralogy. It extends throughout the Freshman year and embraces a comprehensive study of the fundamental principles of geology. The course includes brief, but careful study of dynamical, stratigraphical, structural, chemical, and historical geology, and is conducted by means of lectures, text books, and laboratory work, and frequent excursions to points of particular interest. Under dynamic geology, the atmospheric, aqueous, igneous, and organic agencies are discussed with reference to their bearing on the present and past condition of the earth's surface. Stratigraphical and structural geology consider the conditions of deposition of sediments and of the disturbance of rock masses. A portion of the time allotted to these subjects is devoted to the study of such minerals and rocks as enter most largely into the structure of the earth's surface; also to the methods of geological surveying, including mapping, section making, special problems. Chemical geology includes the study of the general relation which chemistry bears to geological phenomena, such as the formation, metamorphism, and degeneration of rocks, and the origin and alterations of the various kinds of mineral deposits. Under historical geology, the physical history of the earth is discussed, the classification and distribution of sedimentary rocks studied, and the methods of correlation explained. The course aims to equip the student with useful information concerning the phenomena and history of the earth, so that he may know the methods used in geological research, and will better understand how to interpret facts gained in the study of economic deposits.

Freshman Year: Four lecture periods and three laboratory hours per week throughout the year.

Text Book: Chamberlain and Salisbury's Geology, Vol. I, Geologic Processes and Their Results.

Mineralogy 1

General Mineralogy: This course is planned to develop such information as may be needed for quick and accurate determination of mineral species in the field. The course is based on lectures, text book, and laboratory work and embraces frequent rigid quizzes on features of chief importance. The physical properties of minerals are dealt with in the early part of the course; a brief study of Crystallography introducing this part of the subject. This is followed by a careful physical study of the chief economic and rock-making minerals in systematic order. Good collections, containing most of the common species of minerals and many of the rare ones, are arranged for convenient use in the laboratory and museum. Thoroughly accurate observation of labeled specimens from many localities is insisted upon, and every attention is given to simple, practical methods in the determination of unknown materials.

Sophomore Year, First Semester: Three lecture periods and three laboratory hours each week.

Text Book: Moses and Parsons' Mineralogy, Crystallography, and Blowpipe Analysis.

Mineralogy 2

Blowpipe Analysis: This course is closely associated with Course 1 and continues the same object in view, i. e., the teaching of quick methods of mineral determination. It is chiefly a laboratory study, occupying one lecture period and six laboratory hours throughout the second semester of the Sophomore year. Approximately the first third of the semester is de-

voted to the study of blowpipe methods, known minerals being chiefly used. After this, the student is given only unlabeled specimens, the nature and name of which he is required to learn, keeping for reference a detailed record of all results obtained during the process of determination. It is expected that, upon completing this and the preceding course, the student will have gained a fair working knowledge of approximately two hundred of the common minerals, including the chief features of their distribution, uses, value and output.

Sophomore Year, Second Semester: One lecture period and six laboratory hours per week.

Text book: Brush-Penfield's Determinative Mineralogy and Blowpipe Analysis.

Geology 2

Physical Geology, including Metamorphism; The purpose in this course is to bring out in some detail, certain important features, too briefly considered in General Geology, that have close connection with the subject of Petrography and Economic Geology which follow. Processes of disintegration, denudation, and deposition, crustal disturbances, and metamorphic influences receive attention, particularly with reference to their immediate or ultimate relation to ore formation. The physical action of underground water commands careful study, and where physical phenomena are closely connected with chemical activity, the chemical processes in the influencing of mineral reorganization receive proper consideration. In this, as in all other courses described, features of economic importance will receive particular attention, but it should be understood by the student, that the full aim of the course is to af-

ford opportunity for as thorough and comprehensive a grasp of the subjects in hand as the time devoted to them will allow.

Junior Year, First Semester, Three lecture periods and three laboratory hours per week.

Text Book: Lecture notes.

Geology 3

Petrography; This course is intended especially for mining students who need some training in rock determination, but who have opportunity to devote only a brief time to the subject. It embraces the macroscopic and microscopic study of specimens and is conducted by means of lectures, text books, and laboratory work. The lectures are devoted to the discussion of petrographical methods, the nomenclature of rock species, the principles of rock classification, and the origin, distribution, modes of occurrence, alterations and relations of rock masses. The laboratory work embraces the study of hand specimens of rocks, the making of thin rock sections and the examination of such sections by means of the petrographical microscope. Little more than a short summary is given of the refined methods of microscopic analysis, most of the time being devoted to the simpler field methods of determining and classifying the commoner rock types. Two good Zeiss petrographical microscopes, together with necessary accessories, are available for use. There is also a Krantz collection of 350 rock types in hand specimens and in thin sections, and a fairly complete series of Black Hills rocks, a number of which have been thin sectioned for study.

Junior Year, Second Semester: Three lecture periods and three laboratory hours per week.

Text Book: Kemp's Handbook of Rocks.

Geology 4

Economic Geology: This course runs throughout the Senior year and includes study of the origin, modes of occurrence and uses of economic mineral products. Beginning with this year, about one-half of the first semester will be given to the study of non-metallic products. This will include the origin, nature, relations, and value of coal, petroleum, natural gas, salines, building stone, clays, cement, materials, fertilizers, abrasives, gems, etc. The rest of this course will be devoted to the study of metallic products, such as gold, silver, copper, iron, lead, zinc, platinum, mercury, nickel, etc. In this much attention is given to the study of the principles of ore deposition and to the historical development of the theories connected therewith. Careful attention is given to the chief types of deposits and particularly to localities noted for their wealth of output.

Maps, specimens, and original papers are freely used. Attention is given to the history of mineral development, of the life and comparative importance of various regions and of the influence which economic deposits have exerted upon the regions or countries in which such deposits have been found.

The necessity of individual examination by the student of the best, up-to-date literature is insisted upon, and a reasonable ability to properly use such literature is required. Much attention is devoted to the study of the many economic interests of the Black Hills region and observation of the deposits in the field is encouraged.

Senior Year; Four lecture periods per week throughout the year.

Reference Texts: Beck-Weed's Nature of Ore Deposits; Ries' Economic Geology of the United States; Kemp's Ore Deposits of the United States and Canada.

DEPARTMENT OF ENGINEERING

PROFESSOR O'BRIEN.

The aim of this department is to give the student such training in the class room, drawing room and field as will properly fit him for his career as a mining engineer.

The department occupies two well lighted drawing rooms, 24 by 34 and 24 by 30 feet, in size; lecture room and offices. The rooms are furnished with suitable drawing desks which have separate lockers for each student.

The work of this department extends over a period of three years and includes the following courses:

Engineering 1

Mechanical Drawing: Practical work in the drawing room accompanied by lectures as needed. The work is carried on chiefly by means of individual instruction. The course includes the care and use of instruments ; the mounting of sheets; simple geometric construction; orthographic projection; and both free hand and mechanical lettering of titles.

Students taking this course should provide themselves with the following list of supplies, most of which may be obtained from the supply room of the department at cost:

One set of drawing instruments containing:

One pair 6 in. Compasses, with pen, pencil, and needle points.

One pair 6 in. Dividers.
One 5 1-2 in. Ruling Pen.
One 3 1-2 in. Steel Spring Bow Divider.
One 3 1-2 in. Steel Spring Bow Pencil.
One 3 1-2 in. Steel Spring Bow Pen.
One T Square with 30 in. blade.
One 4 1-2 in. Protractor.
Two Irregular Curves, (Dietzgen, No. 10 and No. 19.)
One 7 in. 30 deg. by 60 deg. Triangle.
One 8 in. 45 deg. Triangle.
One 6H Drawing Pencil.
One Pencil Pointer.
One Pencil Eraser.
One Ink Eraser.
One Sponge Rubber.
One dozen Thumb Tacks.
One Pulp Board.
Eighteen sheets Whatman's H. P. 17x22 in. Drawing Paper.
One bottle Mucilage or Glue.
One bottle Black Drawing Ink.
One bottle Red Drawing Ink.

Drawing boards and key for locker are furnished by the School on the payment of a fee of $1 per year; 50 cents of this is refunded on return of key.

Freshman Year: Six laboratory hours per week throughout the year.

Text Books: Morris' Geometric Drawing for Art Students' Alphabets.

Engineering 2

Descriptive Geometry: The work in descriptive geometry is necessary in order that the second and third year drawing may be done intelligently. The course is taken up as outlined in Hall's Descrip-

tive Geometry. It includes the projection of the point and line and the representation of planes and problems relating thereto; generation, classification and intersection of surfaces.

Sophomore Year: One lecture period per week throughout the year.

Text Book: Hall's Descriptive Geometry with Plates.

Engineering 3

Mechanical Drawing: This course is supplementary to the class room work of descriptive geometry and mechanism. The work of this course takes up the development and intersection of plane and curved surfaces. It is designed to run parallel to the course in mechanism, consequently it includes the drawing of cams and gear teeth and analysis of link work.

Sophomore Year: Six laboratory hours per week throughout the year.

Text Book: Reed's Mechanical Drawing.

Engineering 4

Mechanism: This course is given by means of lectures and recitations. The work takes up laws which govern the moving parts of the machine; the design of cams, gear teeth, and link work. The various parts of the machine are discussed in the class room and then are carefully and accurately constructed on the drawing board so that the student may gain a clear idea of the design of the various mechanical movements. This course furnishes a basis for the work of Engineering 3 in the second semester of the Sophomore year.

Sophomore Year, Second Semester: Two lectures periods per week.

Text Book: Stahl & Wood's Elementary Mechanism.

Engineering 5

Mechanical Drawing: This course is for the purpose of giving instruction in methods of representing machine parts. The student is required to make free hand sketches of various parts and then make from his sketch a finished working drawing, properly lettered and dimensioned. Tracing and blue printing are part of the course.

Junior Year, First Semester: Six laboratory hours per week.

Engineering 6

PROFESSOR EHLE.

Graphical Statics: The object of this course is to give an understanding of the theory of the graphical solution of inernal stresses in a framed structure, arising from steady and moving loads, from the pressure of the wind, etc. The student is required to determine by graphical methods on the drawing board, the nature and amount of internal stresses in the various members of such simple roof and bridge trusses and head frames as are assigned him.

Junior Year, First Semester: One lecture period and three laboratory hours per week.

Text Book: Hosking's Elements of Graphical Statics.

Engineering 7

PROFESSOR EHLE

Surveying: It is the desire of the department to bring, as far as is practicable, theory and practice

side by side. For this reason, the discussions in the class room are confined to such principles as can be given a practical application in the field or drawing room.

The institution is provided with all the instruments and accessories necessary to carry on the work. Additional instruments are purchased as the need for them arises.

For the performance of the field work, the class is divided into squads with just a sufficient number in each to properly carry on the work. Each student is required to take his turn at every part of the work; to use each instrument as the occasion demands; to make his own notes and computations; and finally to accurately plot them in the drawing room.

The course outlined is as follows: Linear measurements by means of pacing and chain or tape; adjustment and use of the engineer's transit and level; traversing; principles of land surveying; adjustments and use of the plane table; mine surveying, including the location and patent surveying of claims; shaft plumbing and underground connections; adjustment and use of the solar instrument; geodetic surveying, including the measurement of a base line; measurement of horizontal angles; computations for the adjustment of the triangulation system; determination of the meridian by means of the solar instrument; determination of latitude; direct solar observation and observation on Polaris; measurements of volumes. Railroad surveying will receive as much time as the conditions will permit.

Junior Year: First semester, three lecture periods and nine hours field work per week. Second semester, two lecture periods and nine hours field work per week.

Text book: Johnson's The Theory and Practice of Surveying.

Engineering 8

Hydraulics: The student takes up this course with a knowledge of hydrostatics from his work in Physics 3, and is thus prepared to commence with hydraulics proper, or the study of the laws governing the motion of water. He learns the methods of commercial measurement of water by both weir and orifices. The problems include the computations of diameters of pipes; pressures, and energy of confined water; dimensions of channels and ditches; velocity of flow, etc.

The School is favorably situated for field work in hydraulics. Rapid Creek is a mountain stream with a fall of about 1.6 per cent., offering splendid facilities for weir and velocity measurements; two large irrigation ditches are adjacent to the School, and Rapid City has three water-power plants within the city limits. The students thus have opportunity to visit and study hydraulic power plants in successful operation.

In the latter part of the course the student designs and makes drawings for a complete water-power plant, calculating the size of flumes and ditches, cost of material and excavation; makes plans for wheels, tailrace, etc., as a practicing engineer would be required to do.

Senior Year: Two lecture periods per week throughout the year. Second semester, three laboratory hours per week.

Text book: Mansfield Merriman's Treatise on Hydraulics.

Engineering 9

Thermo-Dynamics: This course begins with a discussion of the theory underlying the operation of heat engines. The theory of the operation of the ideal engine is developed, and the principles governing the actions of steam and gas engines, air compressors and refrigerating machines are fully discussed.

Senior Year: First semester, two lecture periods per week.

Engineering 10

Design of Power Plants: This course applies practically the principles developed in the preceding one. It embraces the history of the development of the steam engine, and a study of the types in successful use; the application of the indicator and Prony brake, and testing of boilers and fuels.

The School has three 40 horse-power boilers and a 40 horse-power Corliss engine; also a gasoline and a kerosene engine. This apparatus is available for laboratory work in this line.

Under the head of hydraulics, the Seniors design a water power plant. (See hydraulics.) In this course the students learn to design the necessary electrical equipment to commercially transmit this power to distant points.

Senior Year: Second semester, two lecture periods per week.

Engineering 11

Strength of Materials: The resistance and

elasticity of the materials of engineering; fundamental assumptions of the common theory of beams; dirtribution of stresses in beams; shearing forces, bending moments, and deflections of beams; the common and exact theory of torsion, flexure, elastic limits; working stresses and ultimate resistance of cast-iron, wrought iron, steel, and timber; pipes and riveted joints; posts and columns; the design of posts, beams, shafts, etc.

Junior Year: Second semester, five lecture periods per week.

Text book: Merriman's Mechanics of Materials.

DEPARTMENT OF CHEMISTRY

PROFESSOR COOLBAUGH. MR. COOLIDGE.

MR. BETTERTON.

The courses in chemistry are designed to give to mining and to metallurgical engineers the knowledge of chemistry most essential to their work. Especial emphasis is given to the laws underlying the science; the separations, estimations, etc., being made with these principles in mind. The purpose is to excite in the student an interest in experimentation, to cultivate methods of accuracy and rapidity in manipulation, and to teach the proper correlation of the results of experiments.

Chemistry. 2

General Chemistry: This course should give the student a knowledge of the principal theories and laws of the science. The following subjects are discussed in an elementary way: Atoms and molecules, gases, liquids, solids, solutions, thermo and electrochemistry, and chemical equilibrium. Some time is

also given to a study of industrial chemical processes, such as the manufacture of acids, alkalies, clay and cements, cyanides, gas and ammonia. In addition, there is a brief study of the metallic elements, introducing elementary metallurgy when those of commercial importance are under consideration.

Freshmen Year: Three lecture periods per week throughout the year.

Reference books: Richter's Inorganic Chemistry; Ostwald's Principles of Inorganic Chemistry; Thorp's Outlines of Industrial Chemistry.

Chemistry 3

Qualitative Analysis: The class work in qualitative analysis begins with an outline of the general scheme of analysis. Then follows a minute study of the metals and the acid radicals with their detections and separations. Emphasis is placed on the principles of oxidation and reduction, the law of mass action and the theories of ionization and hydrolysis. Separations are made before the class in order to given an idea of the correct use of reagents and of the methods for rapid manipulation.

Freshman Year: Two lecture periods per weeek throughout the year.

Reference books: Prescott & Johnson's Qualitative Analysis; Treadwell's Qualitative Analysis.

Chemistry 4

Quantitative Analysis: The class work in quantitative analysis consist of: discussions of the relative merits of methods applied in the laboratory, the study of articles and reviews from chemical periodicals, and the subject of chemical calculations.

Sophomore Year: Two lecture periods per week throughout the year.

Reference books. Miller's Notes on Quantitative Analysis; Miller's Calculations on Analytical Chemistry; Treadwell's Quantitative Analysis; Sutton's Volumetric Analysis; Low's Technical Methods of Ore Analysis.

Chemistry 5

Metallurgical Chemistry: This course is to familiarize the student with the analytical methods used in conjunction with metallurgical processes. The subjects studied are: The technical methods connected with the metallurgy of iron, steel, zinc, lead, and copper; the determinations of bismuth, mercury, cadmium, tin, nickel, and the rare elements of commercial importance, and the analysis of electrolytic slimes.

Prerequisites, Chemistry, 2, 3 and 4, or equivalents.

Junior Year: One lecture period per week throughout the year. Required of Juniors taking the metallurgical option.

Chemistry 6

Qualitative Analysis, Laboratory: This covers the separation of metals and acids in solutions, dry mixtures, minerals, slags, and alloys. Numerous tests are made with the blowpipe, and the spectroscope is used for the detection of the alkali and alkaline earth metals.

Freshman Year: Nine laboratory hours per week throughout the year.

Chemistry 7

Quantitative Analysis, Laboratory: The course covers the subject of mineral analysis, including both

gravimetric and volumetric methods. The analyses required are: Magnesium sulphate, sodium or other chloride, potassium alum, coal, iron ammonium alum, iron ore, pig iron, spiegel or manganese ore, zinc ore, copper ore or matte, brass, lead ore, chromic iron, limestone, arsenic ore, antimony ore, slag, and gas analysis.

Sophomore Year: Nine laboratory hours per week throughout the year.

Chemistry 8

Quantitative Analysis, Laboratory: Work corresponding to Chemistry 5.

Junior Year: Six laboratory hours per week throughout the year.

DEPARTMENT OF MATHEMATICS

PROFESSOR MCLAURY.

The engineer, from the very nature of his work, must of necessity meet many dificult problems. His success will depend on his ability to solve them. As it is imposible to tell in advance just what experiences a given student will meet, that course is best which results in mental power. It is not a question of what the student has done, but what he can do. Has he a comprehensive grasp of the subject; has he thoroughly mastered the principles; can he apply these principles to kindred subjects?

The aim of this department will be to give the student a thorough knowledge of the principles of mathematics so as to enable him to apply them readily to the solution of practical problems. Original work is encouraged, and an effort is made to culti-

vate the habit of exact logical reasoning, and to stimulate independent thought. Both rapidity and accuracy are expected in all mathematical work. The great importance of mathematics as the basis of a scientific education justifies the requirements of all elementary courses, as a prerequisite to the Mining Engineering Course.

No course in Algebra is offered in the Engineering Department. However, in the following courses, particular pains will be taken to explain all the more difficult algebraic processes as they occur. Several subjects in higher algebra will be discussed, each at the point where it is required for immediate application. Sutdents who have not studied algebra for a year or more, should make a careful review before entering school, for a thorough knowledge of the elements of algebra is essential to the successful compeletion of all subsequent courses.

Mathematics 7

Trigonomery: Plane, analytical, and spherical. Considerable attention is paid to the consistent and scientific development of the fundamental conventions and definitions, and to the derivation and transformation of trigonometric expressions. Many practical problems are solved.

Freshmen Year: First semester, five lecture periods per week for sixteen weeks.

Text book: Phillips & Strong's Trigonometry.

Mathematics 8

Analytic Geometry: This course includes the following subjects: Loci; straight lines; transformation of co-ordinates; circles; conic sections; the general equation of the second degree and higher plane curves.

The theory will be developed by lectures.

Freshmen Year: Second semester, five lecture periods per week for eighteen weeks.

Text book: Nichol's Analytic Geometry, with Smith & Gale, Puckle, Ashton, and C. Smith for reference.

Mathematics 9

Differential Calculus: The text book work is supplemented by lectures. This course will include the discussion of a few subjects in higher algebra and will be preceded by a short course in solid analytic geometry, based on Nichol's Analytic Geometry.

Sophomore Year: First semester, five lecture periods per week.

Text book: Osborn's Calculus.

Snyder & Hutchinson, Granville, and Williamson are used for reference.

Mathematics 10

Differential and Integral Calculus: This course is a continuation of the last course and will include the most of the work in Osborn's Calculus.

Sophomore Year: Second semester, five lecture periods per week.

Mathematics 11

Mechanics: The theory is developed by lectures. The aim is to present the fundamental principles in as clear and simple manner as possible. Many problems will be solved to enforce the principles and to develop ability in the student to apply what he has learned to practical problems. Partic-

ular effort is made to cultivate the power of the student to use calculus methods when needed. The course includes the following subjects:

Statics: First principles; units, composition and resolution of concurring forces; composition and resolution of forces acting on a rigid body; conditions of equilibrium; center of gravity; friction; virtual velocities; machines; the funicular polygon and the catenary.

Kinematics: Rectilinear and curvilinear motion; composition and resolution of acceleration; angular velocity and angular acceleration; projectiles, etc.

Kinetics: Laws of motion; motion under the action of a variable force; motion in a resisting medium; constrained motion; the simple pendulum; centripetal and centrifugal forces. Impact; work and energy; moment of inertia.

Junior Year: First semester, five lecture periods per week.

Text book: Bowser's Analytic Mechanics; the works of Church, DuBois, Hoskins, Johnson, Lanza, Todhunter, and Routh, are used for reference in this and the following course.

DEPARTMENT OF PHYSICS

Mr. Sturges

The courses offered by the department are as follows:

Physics 3

Advanced Physics: The subjects treated in the first semester are: Mechanics, hydrostatics, sound, and light. The mechanics of fluids receives the benefit of much time and the complete treatment

here serves as an introduction to the study of hydraulics in the Senior year. The work of the semester ends with a review of the principles of light, and a discussion of the spectroscope and polariscope. In the second semester the course is continued by treating the subjects, heat, electricity, and magnetism. In the subject of heat particular attention is given to the expansion of gases and vapors, special heat, and the relation of heat and energy, that the student may have a good foundation for thermo-dynamics.

The subject of electricity receives detailed and careful consideration. The laws of electrolysis, resistance, and potential are developed, and a comprehensive study of electrical measuring instruments, dynamos, motors, etc., is entered into. The relative advantages of alternating and continuous currents for different purposes is pointed out This course gives the student good preparation for his subsequent work in mining and metallurgy.

Sophomore Year: Two lecture periods per week throughout the year.

Text book: Carhart's University Physics.

Physics 4

Laboratory work in connection with Physics 3:

The aim of the laboratory work in this course is not so much to perform a large number of experiments, as to learn to work with care and accuracy. Determinations are made of the coefficient of friction; buoyancy of the atmosphere; acceleration of gravity, etc. Complete reports of all experiments are required, and when possible, they are accompanied by appropriate curves.

In the experimental work in heat, particular attention will be given to such practical determina-

tions as the calorific power of fuels; melting and boiling points; and the expansion of vapors and gases.

The laboratory is well equipped for an extensive course in electrical testing. The apparatus includes a permeameter, magnetometer, condensers, induction coils, static machines, X-ray tubes, etc. Dynamos, motors, and lamps are available for the purpose of making tests of commercial efficiency. The school machine shop is at the disposal of students for the purpose of constructing apparatus for research work.

The general application of electricity to mining makes this course of value and interest to the mining engineer.

Sophomore Year: Three laboratory hours per week throughout the year.

DEPARTMENT OF ENGLISH

Professor McLearie.

The aim of this department is to give the student a command of good idiomatic English and to aid him n the development of the art of expression. Especial emphasis is laid upon the importance of good composition in technical work. Attention is called to the absolute necessity that every professional man should be able to express his thoughts with clearness and accuracy.

English 5

Composition 5: The elements of effective writing: This course gives both theoretical and practical instruction. The theory is taught by class room work based on standard text books. The practice is obtained by exercises written in the class room,

and by weekly themes. At least one theme a week is required, and every theme is returned to the student to be revised or rewritten.

Freshmen Year: Three lecture periods per week throughout the year.

Text books: Wendell's English Composition; Pearson's Principles of Expression.

English 6

Composition 6: This course supplements the work of the Freshman year by giving further practice in narrative, expository and argumentative writing. A study is made of the works of such authors as will aid in practical composition work. Three themes are required, each containing from 800 to 1,000 words. There will be a conference on each theme.

Sophomore Year: First semester, two lecture periods per week.

LIST OF STUDENTS IN MINING AND METALLURGICAL ENGINEERING.

SENIOR CLASS.

Cooledge, Cyril ---- De Smet, South Dakota
Goodner, Ivan E. ---- Pierre, South Dakota
Hebblethwaite, Leon L. ---- Evanston, Illinois
Ives, Glen P. ---- Alexandria, South Dakota
Overpeck, Lem ---- Rapid City, South Dakota
Ossa, I. Diaz ---- Santiago de Chile
Sparling, William ---- Rapid City, South Dakota
Woodward, Dan C. ---- St. Marys, Ohio
Winters, Fred W. ---- Mazeppa, Minnesota

JUNIOR CLASS.

Bennett, Richard T. ---- Pierre, South Dakota
Betterton, Jesse O. ---- Columbus, Nebraska
Coolidge, Roy R. ---- Columbus, Nebraska
Hunter, George R. ---- Deadwood, South Dakota
Hvistendahl, E. A., B. S., U. of S. D. Vermilion, South Dakota
Jones, H. W., B. S., U. of S. D. ---- Vermilion, South Dakota
Ledyard, L. W. ---- Sioux Falls, South Dakota
McLain, Dan ---- Yankton, South Dakota
Marshall, William C. ---- Rapid City, South Dakota
Read, Herbert ---- Rapid City, South Dakota
Sargent, Arthur E. ---- Rapid City, South Dakota
Smith, Amos ---- Yankton, South Dakota

SOPHOMORE CLASS.

Ballard, Peter A. ---- Rapid City, South Dakota
Betts, C. W. ---- Mitchell, South Dakota
Elliott, J. W. ---- Columbus, Nebraska
Eddy, J. W. ---- Helena, Montana
Hartgering, J. M. ---- Rapid City, South Dakota
Jeffries, Zay ---- Pierre, South Dakota
Keelyn, J. L. ---- Evanston, Illinois
Saville, Joe ---- Rapid City, South Dakota
Wheelock, Harry E. ---- Rapid City, South Dakota

FRESHMAN CLASS.

Anderson, William ---------- Rapid City, South Dakota
Adams, C. W. ---------- Mitchell, South Dakota
Brooks, Floyd ---------- Rapid City, South Dakota
Barker, John E. ---------- Deadwood, South Dakota
Ehle, Chester ---------- Marshalltown, Iowa
DeGroot, George R. ---------- Salt Lake City, Utah
Mosier, Peter ---------- Rapid City, South Dakota
Quinney, Edwin H. ---------- Alexandria, South Dakota
Smith, G. M. ---------- Aberdeen, South Dakota
Scott, C. R. ---------- Idaho Springs, Colorado
Winsor, Frank H. ---------- Mitchell, South Dakota
Willard, Clarence ---------- Deadwood, South Dakota

SPECIAL STUDENTS. (Mining)

Arpeno, Louis ---------- Greenmont, South Dakota
Nyswanger, L. ---------- Rapid City, South Dakota
Peterson, Evert ---------- Deadwood, South Dakota
Damours, C. E. ---------- Virginia City, Montana
Alamos, Gmo. A. ---------- Santiago de Chile
Mansfield, Ruth ---------- Rapid City, South Dakota

ALUMNI OF THE SOUTH DAKOTA SCHOOL OF MINES

Eighteen Hundred Eighty-Eight

John W. Hancher, B. S., M. A., President Iowa Wesleyan University, Mt. Pleasant, Iowa.

Eighteen Hundred Ninety

Carrie Feigel, B. S,, Rapid City, S. D.

Benjamin Poznansky, B. S., Denver, Colo.

Eva H. Robinson, B. S., 1907, Post-graduate student of University of Chicago.

Eighteen Hundred Ninety-One

Ottilie H. Behrens, B. S., Rapid City, S. D.

Nineteen Hundred One

G. Howell Clevenger, B. S., School of Mines ; M. A., Columbia University, New York; 1903, Mill Superintendent, Horseshoe Mining Co., Deadwood, S. D.; 1904-5, Instructor in Metallurgy, Stanford University, California; 1906, Consulting Engineer, San Francisco, Cal.

Max R. Hopkins, B. S., with Scranton Correspondence School Kansas City, Mo.

Nineteen Hundred Two

Areli C. Overpeck, B. S., E. M. 1902-3, Chemist and Assayer, National Smelting Co., Rapid City, S. D. 1903, Superintendent Dakota-Calumet Mining Co., Hill City, S. D.

C. C. Thompson, B. S., E. M. 1902-3, Assayer, Clover Leaf Mining Co., Roubaix, S. D. 1904, United States Deputy Mineral Surveyor, Deadwood, S. D. 1905, Assayer, Lone Star Mining Co., Pis Pis, Nicaragua. 1906, United States Deputy Mineral Surveyor for Nevada Goldfield, Nevada.

Nineteen Hundred Four

U. S. S. Arentz, B. S., E. M. 1904-5, with Black Rock Mining Co., Constellation, Arizona. 1905, with Trade Dollar Extension Co., Silver City, Idaho. 1906, Engineer and Assistant Superintendent of Utah Apex Mining Co., Bingham Canyon, Utah. 1906, Superintendent Nevada-Douglas Copper Co., Yerrington, Nevada.

Arthur E. Hall, B. S., Met. E. 1904-5, Smelter work, Butte, Montana and Jerome, Arizona. 1904-5, Chemist, National Smelting Co., Rapid City, S. D. 1906-7, Superintendent Standard Smelting Co., Rapid City, S, D. 1907, Chemist Mountain Copper Co., Keswick, Cal. 1907-8, Superintendent Blast Furnace Department, American Smelting and Refining Co., Omaha plant.

Elmer W. West, B. S., E. E., with American Smelting & Refining Co., Omaha, Neb.

Guy E. Wolcott, B. S., Mining Engineer, Cripple Creek, Colo.

Nineteen Hundred Five

O. Allen Anderson, B. S., E. M. 1905, Assayer, Dakota Mining Co., Deadwood, S. D. 1906-7, Mill Superintendent, Dakota Mining Co., Deadwood, S. D. 1907-8, Instructor in Metallurgy. S. D. School of Mines, Rapid City, S. D.

Hollis W. Overpeck, B. S., E. M. 1905, Assayer, Kimberly Gold Mining Co., Jardine, Montana. 1905, Metallurgist Buckskin Mountain Copper Co., Fredonia, Arizona.

James Halley, Jr., B. S. 1905, Cashier Keystone Bank, Keystone, S. D.

Nineteen Hundred Six

Louis L. Penhoel, B. S., 1906-7, Assayer and Chemist, Grand View Mining Co., Silver City, S. D., 1907-8, Assayer, Wasp No. 2 Mining Co., Deadwood, South Dakota.

Peter Whytock, C. S., Mining Engineer, Rawhide, Nevada.

William Gaines, B. S.. 1906, Assayer, Reliance Mining Co., Deadwood, S. D.

B. D. O'Brien, E. E., Rose Polytechnic, Indiana; B. S., South Dakota School of Mines. 1898-1905, Mechanical Engineer, Golden Reward Mining Co., Deadwood, S. D. 1906-7, Instructor in Engineering, South Dakota School of Mines. 1907, Professor of Engineering, South Dakota School of Mines.

J. B. Read, B. S., 1907, Chemist, Standard Smelting Co., Rapid City, S. D. 1907, Chemist, Bishop Creek Mining Co., Bishop, Calif.

Harry T. Curran, B. S , Guanajuato Cons. G. M. & M. Co., LaLuz, Guanajuato, Mex.

Frederick Wetherald, B. S., 1906, Homestake Mining Co., Lead, S. D.

Earl Van L. Smith, B. S.

Edwin Coolidge, B. S., Assayer, Kendall Gold Mining Co., Kendall, Mont.

Herbert Seiter, B. S., 1907, with Reliance Gold Mining Co., Deadwood, South Dakota.

Nineteen Hundred Seven

Frank Bryant, B. S., Reliance Gold Mining Co., Deadwood, S. D.

Frank Anderson, B. S., Assayer, Lucky Strike Mining Co., Deadwood, S. D.

Wharton Cornell, B. S., 1711 Rodney St., Wilmington, Delaware.

Otto Ellerman, B. S., Assayer, Golden Reward Mining Co., Deadwood, S. D.

Bernard Matson, B. S., Assayer, Branch Mint Mining Co., Galena, S. D.

Lloyd Mellinger, B. S., Assayer and Chemist, Mountain Copper Co., Keswick, Cal.

Milton Morris, B. S., Golden Crest Mining Co., Deadwood, S. D.

C. C. Van Nuys, A. B., Yankton College; B. S., South Dakota School of Mines. Post graduate student at Columbia University, New York City.

Charles Whitmore, B. S. With the Dakota-Calumet Mining Co., Hill City, S. D.

Leon Peck Wells, B. S., Mine Surveyor, Copper Queen Mining Co., Bisbee, Arizona.

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ANNUAL CATALOGUE OF
SOUTH DAKOTA STATE

SCHOOL of MINES

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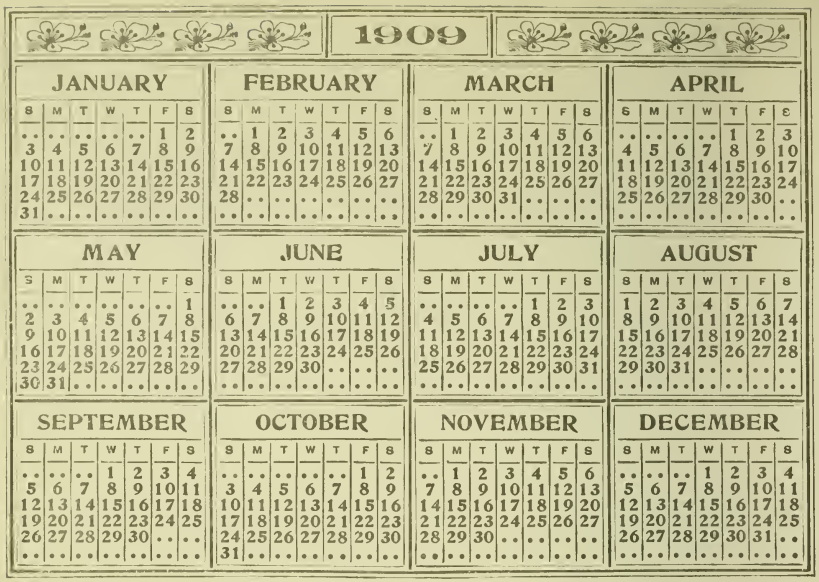
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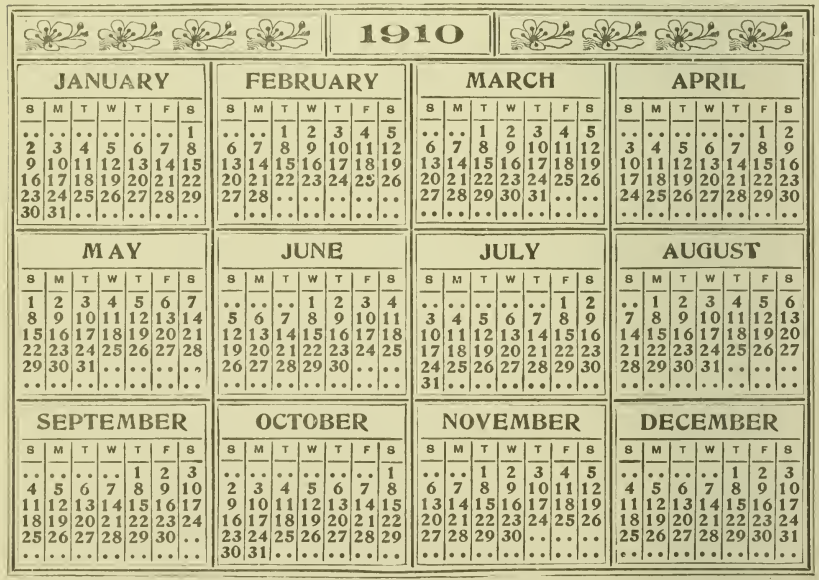
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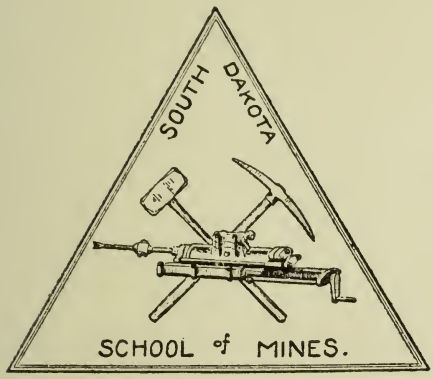
THE SOUTH DAKOTA STATE SCHOOL *of* MINES



ANNUAL CATALOG

1909-1910

1909
Will A. Beach Printing Co.,
Sioux Falls, S. D.

COLLEGE CALENDAR

School Year begins....Wednesday, September 15, 1909
Entrance Examinations begin.....September 13, 1909
Registration Committee considers applications for Advanced Standing and Credentials for Admission without examinations..September 14, 1909
Thanksgiving Day recess.....November 25 to .....November 29, 1909
Christmas vacation.....December 22, 1909 to .....January 5, 1910
Examination week .....January 24, to .....January 29, inclusive, 1910
First Semester ends.....January 29, 1910
Second Semester begins.....January 31, 1910
Washington's Birthday Anniversary.February 22, 1910
Spring Recess.....April 11 to 18, 1910
Examination Week.....May 23 to 28, inclusive, 1910
Baccalaureate Sermon.....May 29, 1910
Memorial Day.....May 30, 1910
Granting of Diplomas in Preparatory Department .....May 31, 1910
Faculty and President's Reception.....June 1, 1910
Commencement and Conferring of Degrees..... .....June 2, 1910
Second Semester ends.....June 3, 1910

REGENTS OF EDUCATION

MEMBERS OF THE BOARD

THEODORE W. DWIGHT, Sioux Falls,
Term expires January 1, 1915.

A. E. HITCHCOCK, Mitchell,
Term expires January 1, 1915.

ALBERT M. ANDERSON, Sturgis,
Term expires January 1, 1911

E. C. ERICSON, Elk Point,
Term expires January 1, 1913.

A. J. NORBY, Sisseton,
Term expires January 1, 1913.

OFFICERS OF THE BOARD

E. C. ERICKSON, President, Elk Point
IRWIN D. ALDRICH, Secretary, Big Stone.
GEORGE G. JOHNSON, (State Treasurer.)
Treasurer Exofficio.

REGENTS' COMMITTEE IN CHARGE OF THE SCHOOL OF MINES

A. M. ANDERSON T. W. DWIGHT.

FACULTY

Charles Herman Fulton, President and Professor of Metallurgy.
E. M., Columbia University.

Cleophas Cisney O'Hara, Professor of Mineralogy and Geology.
A. B., Carthage College, Ph. D., John Hopkins University.

Howard Lincoln McLaury, Professor of Mathematics.
A. B., Oberlin College. A. M., Harvard University.

Mark Ehle, Jr., Professor of Mining.
E. M., Colorado School of Mines.

Melville Fuller Coolbaugh, Professor of Chemistry.
B. S. Colorado College. A. M. Columbia University.

John McLearie, Professor of English.
A. B., Macalester College. A. M. University of Chicago.

Barrington D. O'Brien, Professor of Engineering.
B. S., South Dakota School of Mines.
E. E., Rose Polytechnic.

Clarence Leslie Lewis, Lecturer on Mining Law.
University of Michigan.

Adelbert Dale Humbert, Principal Preparatory Department; Instructor in Mathematics and Preparatory Science.
Cornell College.

Claude C. Van Nuys, Instructor in Physics.
A. B., Yankton College; B. S., S. D. School of Mines; A. M., Columbia University.

Oscar Allen Anderson, Instructor in Metallurgy.
B. S., E. M., South Dakota School of Mines.

Christian Trygstad, Instructor in Modern Languages and History.
A. B., St. Olaf College. A. M., University of Minnesota.

DELLA MAY HAFT, Librarian.
Ph. B. University of Chicago.

LULU QUIST, Registrar and Secretary to the President.

ROY COOLIDGE, Assistant in Chemistry.

WILLARD C. MARSHALL, Assistant in Assaying.

JESSE OATMAN BETTERTON, Assistant in Chemistry.

ZAY JEFFRIES, Assistant in Geology.

OTHER EMPLOYES

WILLIAM A. COURSEN, Superintendent of Grounds and Buildings.

MRS. A. O. ANDERSON, Janitor.

FRANK BOYD, Fireman.

STANDING COMMITTEES OF THE FACULTY

Committee on Admission and Registration:

Professor McLaury
Professor Ehle
Professor Coolbaugh
Professor McLearie
Mr. Humbert

Committee on Emergencies and Discipline:

Professor O'Hara
Professor McLearie
Professor Ehle
Professor McLaury

Committee on Course of Study:

Professor Ehle
Professor O'Hara
Professor O'Brien

Committee on Catalogue and Publications:

Mr. Humbert
Professor O'Brien
Mr. Van Nuys

Committee on Library:

Miss Haft
Mr. Van Nuys
Professor Coolbaugh

Committee on Athletics:

Professor O'Brien
Professor McLearie
Mr. Trygstad

Committee on Student Organizations:

PROFESSOR COOLBAUGH
PROFESSOR MCLEARIE
MR. ANDERSON

Committee on Theses:

PROFESSOR COOLBAUGH
PROFESSOR O'HARA
PROFESSOR O'BRIEN

The Board of Control of the Athletic Association:

PROFESSOR EHLE, Chairman
MR. ZAY JEFFRIES, Secretary
PROFESSOR MCLEARIE
PRESIDENT FULTON
MR. WM. ANDERSON
MR. JESSE BETTERTON
MR. CHARLES HUNT

The regular meeting of the faculty is held on the first Monday of each month.

GENERAL STATEMENT

Establishment of the School.

The School of Mines is a state educational institution, and is at the present almost wholly maintained by appropriations of the State Legislature. It is endowed with 40,000 acres of land, lying in the State of South Dakota, and a grant from the federal government. It receives a comparatively small income from the rental of these lands, which are, however, steadily increasing in value. The school is under the Regents of Education. The regents, five in number, are appointed by the governor, confirmed by the senate, and have control of the various public institutions of learning maintained wholly, or in part, by the State as State Institutions.

The following is an extract from the act of the legislature, establishing the School of Mines.

Section 1. (School of Mines Established.) That a School of Mines for the Territory of Dakota be established at Rapid City, in Pennington County, Dakota Territory. It shall be the object of such School of Mines to furnish facilities for the education of such persons as may desire special instruction in Chemistry, Metallurgy, Mineralogy, Geology, Mining, Milling, Engineering, Mathematics, Mechanics, Drawing, the Fundamental Laws of the United States, and the Rights and Duties of Citizens.

Approved March 7, 1885.

HISTORY AND AIM OF THE SCHOOL

The chief aim of the State School of Mines is to offer young men a thorough education in mining and metallurgical engineering, believing that thereby the exploitation of the mineral resources of the State will be aided. Whenever it is possible, the School also aids the development of the mineral resources by the investigation of mining and metallurgical problems which arise in the state. At the present time, many

graduates of the School are employed in responsible positions in the Black Hills and throughout the West generally, and are doing much toward the developing of the State's mineral wealth. It is well known that the successful exploitation of the Cambrian ores of the Black Hills was due in a large measure to the experiments performed at the State School of Mines. This refers particularly to the chlorination process and to sulphide smelting. The School issues, from time to time, bulletins treating of Black Hills economic geology, and of mining and metallurgical methods, which can be obtained by those interested, upon request.

The first building of the School was erected in 1885, and is a three-story brick structure in which were originally, chemical and assay laboratories, and class rooms. The staff of instructors was necessarily small and the course by no means complete. The School, however, under able management, steadily though slowly gained in reputation, and, in 1887, erected a second building to serve the purpose of a metallurgical laboratory. This building is 138 by 60 feet in size, and was fitted with metallurgical and mining experimental machinery. In 1901 what is now the Main Building of the School was erected, the legislature appropriating $20,000 for that purpose. In 1903 another $20,000 was appropriated by the legislature for an addition to the Main Building, and $5,000 was appropriated for the construction of a separate heating plant. In 1905, $8,000 was appropriated for the improvement of the metallurgical laboratory and extension of the heating plant, etc., and in 1907, $15,000 for additions to the metallurgical laboratory.

The number of buildings and equipment, at the present time, is such as to give good facilities for thorough instruction in mining and metallurgy, and allied subjects.

LOCATION

The School of Mines is located in Rapid City, in the foot hills of the Black Hills of South Dakota. It is on the Chicago & Northwestern Railway, on that branch extending from Omaha to Deadwood and Lead, South Dakota. Rapid City has direct connection with the eastern part of the state, by means of a branch of the same railroad from Pierre; and also by the Chicago, Milwaukee & St. Paul Railway from Chamberlain, South Dakota. It has also connection with the Burlington system by means of the Missouri River & Northwestern Railway from Rapid City to Mystic.

Rapid City is a growing city of about 5,000 inhabitants. It was founded in 1876 and is the most beautifully located town in the Black Hills. It is situated on Rapid Creek, and a half hour's walk takes one either out on the plains or into the hills. It has large stores of all kinds, and living is comparatively cheap for a western town. It offers many advantages as a college and residence city. It has seven churches, representing practically all the principal denominations. There are costly water works fed by springs, four miles back in the hills; also a modern illuminating gas works and an electric lighting plant, furnishing the city with light and a modern sewer system.

The elevation of the city is 3,200 feet above sea level and the climate is a very healthful one, the winters being usually mild and the summers cool. The climate is dry, the average rainfall being about 20 inches.

There is much social life in the town, and students after becoming acquainted, may enjoy the influences of home life. The students of the School find board and lodging in the homes, as the School does not maintain a dormitory.

The distance to Deadwood is only 46 miles and but a little more into the heart of the great produc-

ing mining section of the Hills. The mining districts of Keystone, etc., are within 25 miles of Rapid City. It was thought desirable to locate the School at some distance from the active mining region, rather than directly within it, for it is now realized in technical education that the teaching of the fundamental sciences must be thoroughly accomplished before their technical application can be considered. If the School were located directly within the bustle of the mines and mills, it is very probable that, to some extent, the extremely practical surroundings might interfere with proper methods of study of the preliminaries.

In the last two years of the course, many visits are made to the active mining districts for the purpose of a close study of the methods in vogue. It is the intention, within the next year or so, to establish a summer school of mining to last six to eight weeks, in order to give the student a still more practical acquaintance with mining and metallurgical methods.

The location of the School is very favorable for the study of Geology. The Black Hills have long been known to afford remarkable facilities for the field study of Geology, in that the rocks of practically all ages are exposed in the uplift of the Black Hills. The great eruptive districts of the northern Hills afford fine opportunities for this branch of Geologic study.

Close to the School, within a few hundred yards, is the pyritic smelting plant of the Standard Smelting Company, which treats the ores from the surrounding districts. It smelts ores, collecting the values into a matte which is shipped to other plants for refining. This plant affords the more advanced students in Metallurgy every facility for an intimate study of a very interesting process. The management of the plant extends every courtesy to the students of the School of Mines.

BUILDING AND EQUIPMENT

Buildings and Grounds

The buildings in which the work of the School is carried on are three in number: First, the original School of Mines building, a commodious brick structure, three stories in height, situated in the west part of the grounds, and at the present time devoted entirely to the Preparatory Department, in which students, found deficient in studies for entrance into the School of Mines, are properly prepared. It contains a large assembly room and class rooms for the study of languages, mathematics, history, and a laboratory for biology. It is heated throughout by steam, furnished from the central power plant, and is lighted by electricity.

In the center of the grounds is the main building of the School, a large brick structure, with native sandstone trimmings, three stories in height, built in two wings in the shape of a T. This building contains in the front wing, on the first floor, a large entrance hall, a Geological Museum, class rooms in Mathematics and English, the President's and the Registrar's offices. On the second floor are chemical laboratories, comprising the general, qualitive and quantitive laboratories, and offices and class rooms of the Department of Chemistry. The basement of the building contains the physical laboratory, store rooms and a lunch room. The first floor of the rear wing of the main building contains the Library and the balance of the Department of Geology and Mineralogy, consisting of class rooms and offices, and a thoroughly equipped mineralogical laboratory. The second floor contains the Department of Engineering, consisting of instructor's offices, two large drawing rooms for the Freshmen and Sophomore classes respectively, a large lecture room, and a thoroughly equipped room for mak-

ing blue prints. In the basement of this wing is a well equipped machine shop and store rooms. The machine shop serves the purpose of enabling the School to make a very appreciable amount of apparatus for scientific work as the occasion for its construction arises.

East of the Main Building is the Metallurgical Laboratory Building, 138 feet by 60 feet in plan, two stories in height, built of red brick with stone trimmings. This building is devoted exclusively to the Department of Mining and Metallurgy. It contains, on the first floor, a large chemical laboratory for advanced metallurgical chemistry, a well equipped balance room, containing massive concrete piers for the mounting of balances, private chemical laboratory and supply room, assay laboratory and a large assay furnace room. In the rear of the assay furnace room is the metallurgical laboratory containing mining and metallurgical machinery and apparatus.

On the second floor are located the lecture rooms of the Department of Mining and Metallurgy, offices of these departments, and a Mining and Metallurgical Museum.

On the east part of the school grounds is located the central heating plant, containing boilers, etc., which supply the three large buildings mentioned with heat, and the metallurgical laboratory with power. It is built of stone and has adjoining sheds with a large capacity for the storage of coal.

Equipment

In general, the School is well equipped to carry on its work. It has the essential of modern scientific technical instruction, ample laboratory facilities in all required branches.

Library

The libraries of the South Dakota State School of Mines are made up of a general library and the departmental libraries in Metallurgy, Mining, Geology, Chemistry, Engineering, Physics, Biology, English and History.

The general library and reading room occupy a large, well lighted and well equipped room on the first floor of the annex to the Main Building. Here are kept the reference books and others of a general nature, not bearing directly upon the work of any particular department.

Economics, History, Philosophy, Agriculture, and Literature are represented.

In this room is also placed a library of 400 volumes of a miscellaneous nature which the Rapid City Library Association loans the School.

On the reading tables are found the best journals on Mining, Metallurgy, Geology, Chemistry and Engineering, as well as magazines of a more general interest.

The following journals are on file:

Mining and Scientific Press.
Engineering and Mining Journal.
Mines and Minerals.
Mining Reporter.
The Analyst.
Bulletins, American Institute of Mining Engineers.
Bulletins, Institution of Mining and Metallurgy.
Journal, Chemical, Metallurgical and Mining Society of South Africa.
Metallurgie.
Berg and Huetten-mannische Zeitung.
Economic Geology.
Bulletins, Geological Society of America.
Journal of Geology.

Engineering Magazine.
Journal, American Chemical Society.
American Chemical Journal.
Journal of the Society of Chemical Industry.
Electro-Chemical and Metallurgical Industry.
Mining World.
National Geographical Magazine.
Zeitschrift der Anorganischen Chemie.
Exchanges received from student publications.

The reference works contain, among others, complete or partial sets of bound volumes of the following publications:

Transactions American Institute of Mining Engineers.
Transactions Institution of Mining and Metallurgy.
Engineering and Mining Journal.
Mining Reporter.
Bulletins, Geological Society of America.
Journal, Chemical, Metallurgical and Mining Society of South Africa.
Journal of Geology.
American Geologist.
The Mineral Industry.
Bulletins of U. S. G. Survey and others.

The department libraries contain all of the chief books bearing directly upon the work of the respective departments. They are, for the most part, readily accessible to the student. The card system of cataloging is in use.

Drawing Rooms

In the Department of Engineering are two large drawing rooms—one for Freshmen and Sophomore work, the other for Junior work.

The rooms are fitted with especially designed drawing desks, each desk containing lockers in which students take care of their supplies. The drawing rooms

are well lighted by many windows. Adjoining the Freshmen drawing room is a large room for the making of blue prints. It contains the blue print machine, sliding on a frame in the window, with south exposure so that sunlight is avaliable for the greater part of the day. A large sink for the washing of prints is provided.

Chemical Laboratories

There are three chemical laboratories—one for general chemistry, one for qualitative analysis, and one for quantitative analysis. The last two laboratories are equipped with large individual desks with tile tops, each desk being supplied with gas from the city mains. Between the desks are sinks with flowing water. Each student receives a separate and complete set of reagent bottles and supplies. The laboratories are well lighted and provided with ample hoods to carry off the fumes. The quantitative laboratory is equipped with a separate balance room in which are analytic balances of standard makes, among them Becker's and Troemner's.

The apparatus is ample for all mineral, alloy and rock analysis, and includes combustion furnaces, apparatus for gas analysis, and facilities for electrolytic precipitations.

Physical Laboratory

The Physical Laboratory is located in the basement of the annex of the Main Building, thus securing absolutely stable foundations for such apparatus and instruments as require it.

The laboratory is thoroughly equipped with the ordinary physical apparatus, such as balances, Atwood machine, hydrometers, specific gravity apparatus, spectroscopes, apparatus for the measurement of light, calorimeters, electrical apparatus, such as the Wheatstone

bridge, voltmeters, ammeters, galvanometers, engine indicators, etc.

For electrical experimentation, dynamo and motors are available.

Assay Laboratory

The Assay Laboratory is very modern in its appointments. It has, within the last year, been completely remodeled. It contains a room in which the students are provided with individual desks, pulp balances for the mixing of assay charges; a balance room provided with concrete foundation piers; the pulp room in which the ore samples, etc., are crushed and sampled, and the furnace room in which furnace work is done exclusively. This furnace room contains five double muffle-furnaces, heated by soft coal.

They are placed in openings in a heavy dividing wall, separating the machinery hall from the front part of the building. In this way the front of the furnaces with the muffle openings are in the furnace room, flush with the wall, while the firing and taking out of the ashes is done on the other side of the wall, thus avoiding the dust and dirt where it is very undesirable. The furnace room is fire-proof. There is a melting furnace using coke; also gasoline furnaces made by Braun & Company, San Francisco.

The balance room is provided with Ainsworth, Eimer & Amend, Thompson, and Keller balances. In the pulp room an electric motor furnishes power for the small Gates sample crusher and a sample grinder. A Calkins automatic cupel machine is used for the making of cupels. A large number of ore samples are kept on hand. Ores from all parts of this country are provided in great variety. The nearness of a smelter and mills makes it comparatively easy to

procure many types of furnace products, such as mattes, flue dust, fume and umpire samples for close checking work.

Metallurgical Laboratory

The metallurgical laboratory contains machinery and apparatus, mainly illustrative of that used in the metallurgy of lead and copper, gold and silver. There is a 30-inch water-jacket furnace, a small Bruckner roasting furnace, a Baker blower, a Gyratory crusher, two sets of rolls, a wet crushing stamp battery equipped with automatic feeds, amalgamated copper tables, a Wilfley table, two grinding pans, a tube mill, sizing screens, hydraulic classifiers, jigs, a cyanide leaching plant and slimes filtering plant. Most of it is used frequently in the work of the laboratory. Power is furnished by electric motors.

Scientific metallurgical apparatus, consisting of metallographic microscopes, pyrometers, electric resistance furnaces, apparatus for gas analysis, etc., are available for frequent use. A special laboratory is provided in the Metallurgical Building, devoted to metallurgic analysis and research. Students carrying on thesis work in metallurgy have desks in this laboratory.

Mineralogical Laboratory

This is a large room well equipped with low tables arranged for study and determination of minerals. Students are provided with the necessary reagents and apparatus by the department, upon the payment of a small fee. Each student has his own locker. A large working collection of carefully labeled minerals available for student's use is kept in specially designed cases ready of access, and a considerable collection of unknown minerals is at hand for determination.

Geological Museum

The museum is an important feature in the equipment of the School of Mines. Its contents have been chosen to assist in the teaching of geology, mineralogy, petrography and paleontology, rather than to become a store house of curiosities. The room is thirty-six by forty-seven feet in size and lighted by ten large windows.

Two kinds of cases are used for the display of specimens—central cases and wall cases. There are eight central cases, each consisting of two parts of three compartments each, with glazed tops, and a six compartment massive base; the whole constructed in such manner as to serve practically as two sections, fitting tightly, back to back. The display surface, under glass, is nearly fifty feet square for each case. The bases are especially designed for the storage of material not needed for constant exhibition. The cases are of oak.

The wall cases are finished in pine and have glazed doors. Each is seven feet six inches high and contains three double-door compartments of six shelves. The cases are particularly adapted for the display of large specimens.

Cases one and two contain a general collection of minerals arranged according to Dana's system of classification. Cases three and four contain series of specimens to illustrate general features of mineralogy, geology and petrography. Case five contains a collection of well preserved fossils, carefully selected to show the more prominent features of paleontological interest. Case six contains representative collections of Black Hills ores and rocks. Case seven contains Cretaceous and Tertiary fossils from the Black Hills region, mainly from the Cheyenne river and the White River Bad

Lands. Case eight contains a good collection of Black Hills minerals.

The wall cases are for large specimens of all classes, some of which are very beautiful. The collection from the Black Hills is especially noteworthy and is very rich in rare minerals of the region, as for instance, lepidolite, wolframite, columbite, amblygonite, etc.

The museum contains two large topographic maps of the Black Hills made for the St. Louis Exposition.

The museum has also recently been enriched by the gift of a very valuable and unique rock section of the Homestake Mine, donated by the Homestake Mining Company of Lead, South Dakota.

The collection of minerals exhibited by the School at the St. Louis Exposition, 1904, received a diploma and gold medal.

Mining and Metallurgical Museum

This is situated on the second floor of the Metallurgical Building, in a large, well lighted room and contains wall cases for the display of specimens. It has a fair collection of furnace products, such as slags, mattes, etc., wall boards of hoisting ropes and screens, and similar materials. In time it will become a valuable adjunct to the teaching of mining and metallurgical subjects. It is constantly being added to by the kindness of the manufacturers and mining companies, who donate exhibits. The School is always very grateful for donations of this kind and makes due acknowledgement for the same.

Shops

In the basement of the Main Building a large workshop is provided, containing a machine lathe, planers, drill press, other machinery and many tools. Occasion often arises for the design and construction of

certain pieces of apparatus for different departments, especially those of Metallurgy, Mining, Physics and Chemistry.

Many pieces of apparatus have been constructed in this shop which would have cost the School considerable sums of money. The students of the upper classes are granted permission to use the facilities offered by the shop, whenever occasion arises to do so, in their work.

PUBLICATIONS

Bulletin No. 1—Preliminary Report of the Dakota School of Mines upon the Geology, Mineral Resources and Mills of the Black Hills of Dakota; 171 pages. 1888 (Out of print.)

By F. R. Carpenter and H. O. Hofman.

Bulletin No. 2.—Notes on the Geology and Mineral Deposits of a Portion of the Southern Black Hills; 41 pages, Department of Geology. 1899.

By C. C. O'Hara and A. Forsyth.

Bulletin No. 3.—Cyanide Experiments on the Silicious Ores of the Northern Black Hills, etc.; 27 pages; Department of Metallurgy. 1900.

By A. Forsyth and G. H. Clevenger.

Bulletin No. 4.—History of the Early Explorations, etc., in the Black Hills, and Bibliography of Contributions to the Geology of the Black Hills Region; 88 pages; Department of Geology. 1900.

By C. C. O'Hara.

Bulletin No. 5.—The Cyanide Process in the Black Hills of South Dakota; 88 pages; Department of Metallurgy. 1902.

By C. H. Fulton.

Bulletin No. 6.—The Mineral Wealth of the Black Hills; 88 pages; Department of Geology. 1902.

By C. C. O'Hara.

Bulletin No. 7.—Metallurgical Practice in the Black Hills of South Dakota; 63 pages; Department of Metallurgy. 1904.

By C. H. Fulton.

Bulletin No. 8.—The Cement Resources of the Black Hills.

Bulletin No. 9.—Annual Catalog; Descriptive of the Courses Given by the School, and Containing General Information.

Bulletin No. 10.—Announcements containing information about the School, issued regularly.

The publications of the School may be had, free of charge, by addressing the President.

STUDENT'S EXPENSES

Tuition

The tuition and incidental fee is $6 per semester or $12 per year, payable in advance on registration. This fee is the same to residents and non-residents of the state.

According to Section 209 of the Political Code, 1903, page 40:

"The regents shall fix all rates of tuition and other fees, to be paid by students, but such rates shall be the same in all the different institutions. They may receive, in any one of the institutions under their control, free of tuition, two students, appointed by each State Senator, and one by each Representative of the State Legislature, which appointees shall be residents of their respective districts or counties, and whose term shall expire with the term of office of said Senator or Representative, provided that such appointees shall comply with all the rules and requirements of the institution which they desire to enter. No student, however, shall receive any other gratuity whatever.

Fees

Fees enumerated below cover the bare cost of materials and supplies consumed in the laboratories and loss due to breakage, etc.

All fees are payable at the beginning of each semester, on registration. (Consult Departments of Instruction for description of courses.)

Chemistry 1, Elementary Chemistry, per semester	$ 4 00
Chemistry 6, Qualitative Analysis, per semester	7 00
Chemistry 7, Quantitative Analysis, per semester	8 00
Chemistry 8, Metallurgical Analysis, per semester	8 00
Metallurgy 6, Assaying, per semester	25 00
Metallurgy 7, Metallurgical Laboratory, per semester	5 00
Metallurgy 8, per semester	5 00
Mineralogy 1, General Mineralogy, per semester	5 00
Mineralogy 2, Blow-pipe Analysis, per semester	5 00
Geology 3, Petrography, per semester	2 00
Physics 2, Elementary Physics, per semester	1 00
Physics 4, Advanced Physics, per semester	2 00
Engineering 7, Surveying, per semester	3 00
Engineering 3, Mechanical Drawing, per year	1 00
Engineering 5, Mechanical Drawing, per year	1 00
Preparatory Science, Biology, per semester	2 00
Chemistry, 1, 6, 7 and 8, deposits to cover breakage etc.	5 00
Metallurgy 6, deposit to cover breakage	5 00
Metallurgy 7, 8, deposit to cover breakage	5 00
Fee for bachelor's degree	5 00
Fee for advanced degree	10 00

Athletic Association Fee, per year..... 2 00

(Note.—No platinum is furnished by the Department of Chemistry.)

Other Expenses of the Nature of Fees

The Department of Engineering furnishes supplies for the mechanical drawing courses, practically at cost.

Engineering 1, Mechanical Drawing, will cost approximately, $7 for the year, exclusive of drawing instruments, which the student purchases on his own account, prices ranging from $13 up for a good set of instruments.

Engineering 3, Mechanical Drawing, will cost approximately $4 for the year.

Engineering 5, Mechanical Drawing, will cost $2.50 for the year.

Fee for permit for "Conditioned" Examinations $2 00

Living Expenses

Board and room may be obtained in town with private families or in boarding houses or hotels, at rates varying from $20 to $30 per month, according to accommodation; $25 per month is a fair average and will insure good board and room. Rooms only may be obtained for from $5 to $10 per month, and table board for from $4 upward, per week. This makes the expense for board and room for the school year of 37 weeks range from $185 to $275, according to location and accommodation.

Expense for laundry and incidentals vary with the individual. The average for laundry expense is about $20 for the school year.

Cost of Text Books

Freshman year	$13.00
Sophomore year	17.00
Junior year	23.00
Senior year	19.00

Incidental Expenses

Students are required, at various times, to take part in the geological, mining and metallurgical trips undertaken into the Black Hills mining district. The geological trip of the Freshman year usually costs the student about $10. Trips in the Junior and the Senior year, for mining and metallurgical exploration, cost a similar sum; so that the student should figure on a cost of from $30 to $40 at least, for expenses of this kind during his four years' course at the school.

Total cost, including living, fees, books, incidental expenses, etc.

Freshman year	$280 to $380
Sophomore year	275 to 370
Junior year	320 to 430
Senior year	290 to 385

This estimate does not include expenses incurred outside of school. A certain sum for this purpose should be added according to individual taste.

Opportunity for Self Help

Opportunity for self help in town of the size of Rapid City is necessarily limited. It is also to be borne in mind that the course of study is an arduous one and requires the student's best effort, and if conscientiously and satisfactorily performed, will leave comparatively little outside time in which to earn funds.

Some students find employment which nets them their board and lodging by doing chores in private families or assisting in some of the stores. Some find employment in the boarding houses. The School is able to assist Junior and Senior students, to some extent, by employing them in the capacity of assistant janitors and similar work.

Students who have become acquainted, by a residence in town for a year or two, find it easier to obtain help than strangers. For this reason it is essential that a student who comes as a stranger to enter the School should be provided with sufficient funds to carry him through the first year, at the very least.

STUDENT ORGANIZATIONS AND ATHLETICS

The student organizations are the Students' Association and the Athletic Association. The Students' Association has for its aim the general welfare of the student body. The Athletic Association has for its aim the furtherance of legitimate athletics, and maintains football, baseball and basket ball teams, and track athletics. Membership in this association is obligatory, all students paying the annual fee of $2.00. It is governed by a Board of Control made up of three members of the faculty, three students selected from the Sophomore, Junior, and Senior classes respectively, and one Alumni member. The Association maintains baseball, football, and tennis grounds. The school heartily encourages athletics within the proper limits.

The Triangle Club is a students' literary association.

Y. M. C. A.

There is a flourshing Y. M. C. A. in the city, of which many of the faculty and students of the School are members. This organization maintains a very complete reading room and well equipped baths for the use of the members. There is also a gymnasium which supplements the athletics of the School of Mines.

CONDUCT

The School has no codified rules of conduct. Students are held to a strict account of their work and are expected to fulfill their inheritance as gentlemen. Failure to live up to the requirements is considered a sufficient cause for severing their connection with the School.

DETERMINATION OF MINERALS AND ASSAYING

Minerals are determined free of charge. Samples for determination should be addressed to the Department of Geology, State School of Mines, Rapid City. Assays for gold and silver, etc., and chemical analysis, both quantitative and qualitative, are made at a reasonable rate. Prices will be sent upon application to the Department of Metallurgy. All samples for analysis and assay should be addressed to this department.

REQUIREMENTS FOR ADMISSION

Freshman Class

Requirements for admission to the Freshman class of the Mining Engineering course are as follows:

Fourteen units are necessary for entrance.

Required Units

Arithmetic	1 unit
Algebra	1.5 units
Plane Geometry	1 unit
Solid Geometry	0.5 unit
English	2 units
History	1 unit
Physics	1 unit
Chemistry	1 unit
Total required units	9

Elective Units

Elective Units

German	1, 2 or 3 units
French	1, 2 or 3 units
Latin	2, 3 or 4 units
Greek	1 unit
Spanish	1 or 2 units
English	1 or 2 units
History	1 or 2 units
Mathematics	0.5 unit
Science	1 or 2 units
Drawing	1 unit
Shop Work	1 unit
Civil Government	0.5 unit
Bookkeeping	1 unit
Elective units required for entrance,	5

A unit course of study is defined as a course covering a school year of not less than 35 weeks with 5 periods of at least 45 minutes each per week.

Method of Entering the School

First: By Certificate. Graduates of accredited High Schools in the State of South Dakota and other states will be provisionally admitted without exami-

nation, if they present proper credentials, certifying to the fact that they have completed the studies mentioned under the requirements for admission.

Second: By examination. All other candidates for admission to the regular mining engineering course will be required to pass entrance examinations in the subjects specified. These examinations are held at Rapid City, on dates mentioned in the calendar. Students who are deficient in subjects required for entrance into the regular mining engineering course are permitted to enter the Preparatory Department, maintained by the School for the special purpose of preparing students so deficient.

Credentials for entrance should be in the hands of the President on or before the date set in the calendar for the examination of credentials by the committee on admission.

Application for admission blanks will be sent upon request.

Description of Units Required for Entrance

Required units:

Mathematics—The four and one-half units which may be offered in mathematics are as follows:

Arithmetic—One unit, complete, including the metric system.

Algebra—One and one-half units. The equivalent of A, B and C algebra described under Preparatory Mathematics in the Preparatory Catalog.

Plane Geometry—One unit. The equivalent of plane geometry described under Preparatory Mathematics.

Solid Geometry—One-half unit. The equivalent of solid geometry described under Preparatory Mathematics.

English—Two units. The equivalent of English 1

and 2 described under Preparatory English and other courses described in that department.

Physics—One unit. The equivalent of physics described under Preparatory Physics in the Preparatory Catalog.

Chemistry—One unit. The equivalent of elementary chemistry described in the Preparatory Catalog.

History—One unit. The History of the United States, English or Ancient History, as described under History, in the Preparatory Catalog.

Elective Units

The equivalent of courses, not mentioned above, described under Mathematics (trigonometry only.) Languages, History, English, and Preparatory Science, in the Preparatory Catalog.

Special Students

Applicants for admission, who are graduates of colleges or technical schools will be admitted as special students and permitted to take any subject they desire, taught in connection with the regular courses. Persons of mature age, who have been employed in mines and metallurgical plants and who desire to take up special courses, particularly along the lines of mining, metallurgy and geology, will be admitted as special students, provided they show that they have sufficient foundation to take up the work with profit to themselves. No immature person will be permitted to enter the School to take advanced courses, such as Assaying, Metallurgy, etc.

Admission to Advanced Standing

Graduates of colleges and technical schools who enter the School as candidates for a degree will receive proper credit for all such studies which they have com-

pleted and which form part of the curriculum of the School of Mines. The faculty decides these cases upon the basis of individual merit.

DEGREES

The School of Mines offers two degrees: That of Bachelor of Science in Mining Engineering, to the candidate who has successfully completed the regular Mining Engineering course, and that of Bachelor of Science in Metallurgical Engineering, to the candidate who has completed successfully the metallurgical option of the Mining Engineering course.

The degree of Engineer of Mines, or of Metallurgical Engineer, will be conferred upon graduates of the Engineering course of the School, who shall have devoted one year to graduate study in the School of Mines, under the direction of the faculty, passing required examinations upon the studies pursued, or to those who shall furnish suitable evidence of two years' successful experience in mining or metallurgical work, and who shall submit an adequate thesis which shall be duly considered and accepted by the faculty before such advanced degree will be granted.

Students who complete the studies in the Preparatory Department will receive, therefor, the usual diploma.

THESIS

Every candidate for a degree in the regular Mining Engineering course or in the Metallurgical option of that course is required to present a thesis on some subject patent to his course before he will receive his degree. Beginning with the year 1909-10, theses will be assigned to the individual members of the Senior class by a special thesis committee of the faculty. The standard form of thesis shall be the working out of

plans for the development of the hypothetical mine, such subject to be assigned to all students except that the thesis committee may vary the subject as its judgment dictates. Report of progress in thesis work must be made at stated intervals to the thesis committee. Theses must be submitted to the faculty not later than May 15th, and must be typewritten on paper 8½x11 inches in size. Two copies must be furnished; one for the department within which the thesis falls, and one for the Library. No degrees will be granteed unless the conditions concerning theses are fully satisfied.

SUMMER SCHOOL

Beginning with the close of the school year 1909-10, a summer school will be inaugurated, to be held in the Black Hills. It will begin immediately after commencement. Two weeks will be devoted by the Junior class to surveying in the field, and one week by the Senior class to visits to mines and metallurgical works.

COURSES AND DEPARTMENTS

The courses given by the School of Mines are:

First—Mining Engineering Course.....4 years
Second—Mining Engineering Course, Metallurgical Option.....4 years

SYNOPSIS OF COURSES

MINING ENGINEERING COURSE

Freshman Year

First Semester—	Lecture Periods	Laboratory Hours
Mathematics 7, Trigonometry	5	
Chemistry 2, General Chemistry	3	
Chemistry 3, 6, Qualitative Analysis	2	9
Geology 1, General Geology	4	3

	Lecture Periods	Laboratory Hours
Enginering 1, Mechanical Drawing		6
English 5, Composition 5	3	
Second Semester—		
Mathematics 8, Analytic Geometry	5	
Chemistry 2, General Chemistry	3	
Chemistry 3, 6, Qualitative Analysis	2	9
Geology 1, General Geology	4	3
Engineering 1, Mechanical Drawing		6
English 5, Composition 5	3	

Sophomore Year

First Semester—		
Mathematics 9, Calculus	5	
Chemistry 4, 7, Quantitative Analysis	2	9
Mineralogy 1, General Mineralogy	3	3
Engineering 3, Mechanical Drawing		6
Engineering 2, Descriptive Geometry	1	
English 6, Composition 6	2	
Engineering 7,	3	3
Second Semester—		
Mathematics 10, Calculus	5	
Chemistry 4, 7, Quantitative Analysis	2	9
Mineralogy 2, Blowpipe Analysis	1	6
Engineering 4, Mechanism	2	
Engineering 2, Descriptive Geometry	1	
Engineering 3, Mechanical Drawing		6
Engineering 7, Surveying	3	3

Junior Year

First Semester—		
Physics 3, 4, Advanced Physics	3	3
Geology 2, Physical Geology, or Chemistry 5, 8,	3	3
Mathematics 11, Mechanics	5	
Mining 1, Boring, etc	3	

	Lecture Periods	Laboratory Hours
Mining 8, Ore Dressing	3	
Engineering 6, Graphics	1	3
Engineering 5, Mechanical Drawing		6
Second Semester—		
Physics 3, 4, Advanced Physics	3	3
Geology 3, Petrography, or Chemistry 5, 8	3	3
Engineering 11, Resistance of Materials	5	
Mining 2, Tunneling, Shaft Sinking	3	
Metallurgy 1, General Metallurgy	3	
Metallurgy 6, Assaying	2	9

Senior Year

First Semester—		
Mining 3, Hoisting, Transportation, etc	5	
Metallurgy 2, 3, 7, Iron and Steel, Copper and Lead	5	6
Geology 4, Economic Geology, or Metallurgy 5, 8	4	
Engineering 8, 9, Hydraulics and Thermo-Dynamics	4	
Mining 6, Design of Mine Plant		6
Mining 5, Mine Accounting		3
Thesis		3
Second Semester—		
Mining 4, Drainage, Ventilation, etc	5	
Metallurgy 4, 7, Metallurgy of Gold and Silver	5	3
Geology 4, Economic Geology, or Metallurgy 5, 8	4	
Engineering 8, 10, Hydraulics, Power Plant	4	3
Mining 6, Design of Mine Plant		6
Mining 7, Mining Law	1	
Thesis		6

Note: Fifty minutes constitute a lecture period and sixty minutes a laboratory hour.

DEPARTMENTS OF INSTRUCTION

DEPARTMENT OF MINING

PROFESSOR EHLE

The instruction in Mining is given by lecture courses, illustrated by lantern views, photographs and drawings; by frequent references to standard works and current literature; by experimental work on various types of ores, carried on in the mining laboratory, and by excursions to near-by mines and mills for the purpose of observing and noting actual conditions of practice.

The department enjoys, to an unusual degree, those advantages which naturally accrue from the School's location. Being contiguous to a world famous mining region, the nearness of large producing mines means much, while the wholesome mining atmosphere in which the student lives, furnishes a never failing supply of food for enthusiasm and interest.

The mining and metallurgical laboratory of the School, which has proven a most valuable adjunct to the work of instruction, has been completely overhauled and re-equipped with modern appliances of approved design. The various operations attendant upon the preliminary treatment of various types of ore will be carried out by the students, on a scale approaching commercial practice.

A summer school of mining is held each year immediately following the close of school in June.

A suitable mining locality having been decided upon, students, under the direction of instructors, spend a few weeks in the careful study of practical mining, both above and below ground; careful and systematic note taking and sketching of all principal features being a requirement.

Attendance upon this work is obligatory with all members of the Junior class.

The uniform courtesy and good will shown by the management of mining enterprises throughout the region, to instructors and students, indicates a wholesome regard for the efforts of the department and constitutes one of its most valuable assets.

The following courses of study are offered by the department:

Mining 1

Borings: The use of the earth auger, drive pipe, etc., in the boring of holes for wells and for prospecting purposes; the boring of deep holes by the churn drill or drop tool; also by the diamond and other rotary drills; the survey of bore holes; the cost of boring.

Breaking Ground: The excavation of earth and rock in general; hand tools; mechanical earth excavators; rock drills and drilling; channelers; coal cutters; steam shovels; dredges; etc.; estimates and costs of excavations.

Explosives: Black powder, nitro-glycerine, gun cotton, and their derivatives; methods of testing, and calculation of heat and pressure developed; pointing and charging of holes; methods of firing; costs of blasting operations.

Junior Year, First Semester: Three lecture periods per week.

Mining 2

Tunneling: The driving of mine tunnels and drifts through rock and through soft or running ground; comparative cost; general discussion of the methods used in driving large tunnels for railroad or other purposes.

Shaft Sinking: The sinking of shafts for mining purposes through soil, rock, quicksand and other water bearing strata, by approved methods; costs of same.

Supporting Excavations: The use of wood, metal and masonry in the lining of shafts and other excavations, their relative cost, strength and durability; the timbering of stopes, stations, and other working places underground; the preservation of timber.

Junior Year, Second Semester: Three lecture periods per week.

Mining 3

Exploitation: The extraction of mineral by open works; by wells and bore holes; the underground working of veins; bedded deposits, and masses, by methods best suited by each; conditions affecting the choice of methods; costs of ore extraction.

Transportaton: Underground and surface; vehicles and motive powers; self-acting and engine planes; haulage by the trail rope and by the endless rope system; electric and compressed air haulage, surface tramways and aerial rope-ways.

Hoisting: Hoisting engines, their construction and chief features; methods of equalizing the load moment of the engine; ropes, cages, skips and safety appliances; gallow frames; pneumatic hoisting; costs.

Senior Year, First Semester: Five lecture periods per week.

Mining 4

Drainage: Sources of mine water; dams and drainage levels; hoisting of water; direct acting and Cornish pumps; use of compressed air and electricity in pumping operations; special devices; examples and costs.

Ventilation and Lighting: Natural and induced

ventilation; furnaces and fans; friction of air in mines; control of air currents; efficiency of ventilating apparatus; the use of candles; open lights, safety lamps and the electric light in underground illumination.

Hygienic conditions: Surface arrangements for the comfort and convenience of the miner; ascent and descent by ladders, cage or man engine, and relative economy of different methods; accidents, their causes and prevention; rescue and relief of men; mine fires.

Administration: Business management and the principles of employment of labor; organization of mine staff.

Mine Examination: Sampling of ore bodies; estimation of "ore in sight," and the valuation of mining properties; forms of report.

Placer Mining: Sluices, riffles, pipe lines, nozzles and hydraulic elevators, their construction and use; river dredging; costs and results.

Senior Year, Second Semester: Five lecture periods per week.

Mining 5

Mr Humbert.

Mine Accounting: Organization of corporations and stock companies, with particular reference to mining and metallurgical companies; discussion of system of mine and mill accounting; keeping accounts with different departments; derivation of cost sheets, etc.; accounts of smelting and milling plants, yard books, furnace records, ore books, smelting records, etc. General methods of business; buying and selling ores; labor, etc.; organization of the staff of a mining and metallurgical company.

Senior Year, Second Semester: Three laboratory hours per week.

Mining 6

Design of Mine Plant: The student is given certain data, relative to a hypothetical mine, such as maximum depth of hoist, capacity of hoisting, etc., from which he calculates the power needed, selects the type and size of hoisting engines, makes calculations as to the size of reel for flat rope, and drums of different forms, such as to give the best results in the equalization of moment on the engine. He then calculates and designs the gallows frame and shaft house also such features as ore bins, mine car, cage, skip, etc.

Senior Year, six laboratory hours per week throughout the year.

Mining 7

MR. C. L. LEWIS.

Mining Law: During the year Judge C. L. Lewis will deliver a series of lectures before the members of the Senior class, in which he will discuss and exhaustively review the general mining laws with reference to the public lands, embracing, among others the following topics: The early history of mining prior to the enactment of the General Mining Law of Congress; the General Mining Laws of the United States and Territories; Mining Districts, their origin, how organized, and the customs, rules and regulations of miners; lands subject to location and who can locate; the proper location of lode claims; the proper location of placer claims; patent proceedings; timber and stone lands in the mining states, and special laws applicable thereto.

Senior Year, Second Semester: one lecture period per week, fifteen weeks.

Mining 8

Ore Dressing: The principles of ore crushing, description of the various types of crushing machinery; screens and the principles of screen sizing; the theory

and practical application of the dressing of ores by water currents, including descriptions of the principal forms of classifiers; jigs and the laws of jigging; slime treatment, and the machinery for its accomplishment; general discussion of the Continental and English systems of ore dressing, and their American modifications; magnetic concentration; concentration by oil; dry concentration; the description and study of typical ore dressing mills.

Junior Year, First Semester: Three lecture periods per week.

DEPARTMENT OF METALLURGY

Professor Fulton Mr. Anderson.
Mr. Marshall.

Metallurgical subjects are taught by lecture courses with frequent reference to standard works on the subject, and to the current literature.

This work is supplemented, as far as possible, by laboratory testing and experiments and by excursions to neighboring metallurgical works. The School is favorably situated, being contiguous to an active gold mining district, the Black Hills, affording an unparalleled opportunity to study the practical side of metallurgy, particularly that of gold, on a large scale and at close range.

The stamp mills, cyanide plants, and smelter, of Lawrence county are easily reached by rail in a few hours' time, while close to the School is the pyrite smelting plant of the Standard Smelting Company to which students have access for the purpose of study.

A well equipped metallurgical laboratory is available for use, as it is desirable that the student should be thoroughly trained in the basic scientific principles of metallurgy. With actual metallurgical operations, on

a large scale, the student becomes familiar to such an extent as is desirable during his school years, by the frequent visits to the working plants of the district.

In the laboratory, he becomes thoroughly acquainted with the use of pyrometers, calorimeters, microscopes for the examination of metals and furnace products; close and scientific experiments with the refining and heat treatment of steel, electric deposition of metals, formation of slags, refining of metals, cyanide process and amalgamation, etc., as well as to some extent with the actual working of a furnace, stamp mill, concentrating tables, with which the laboratory is provided.

The department is also equipped with a card index of metallurgical literature, which covers all of the subjects of interest very completely, and is at the service of students.

Metallurgy 1

Introductory Metallurgy: This course consists of lectures on the physical properties of metals; on alloys, their types, nature, and properties; fuels; refractory materials; thermal measurements; discussion of metallurgical principles; slags and furnace products, and their nature; types of furnaces and furnace construction; the means of supplying and heating blast; thermochemistry, including a discussion of chemistry at high temperatures; typical metallurgical processes, and the general economic considerations of metallurgy, such as buying and selling ores and metallurgical products. Students are required to do outside reading from references given in the class room, and hand in for examination papers on topics assigned. Laboratory work covering part of this course is carried out in the Senior year, and is described under Metallurgy 7.

Junior Year, Second Semester: Three lecture periods per week.

No text book required. Chief reference work, Roberts-Austen, Introduction to the Study of Metallurgy.

Metallurgy 2

Iron, Steel and Other Alloys: This course consists of lectures on alloys, their classification, structure, properties, metallography; taking up more particularly iron and steel. The hardening and tempering of steel is taken up in detail. The metallurgy of cast iron, wrought iron and steel is discussed in principle, but not in great detail. Especial attention is paid to the principles and chemistry of the iron blast furnace and to the Acid Bessemer process, and to the Acid and Basic Open Hearth process. Statistics of the iron and steel industry are given. The student is required to do considerable outside reading. Laboratory work in connection with this course is described under Metallurgy 7.

Senior Year, First Semester, seven weeks: Five lecture periods per week.

Text book: Howe's Iron, Steel and Other Alloys.

Metallurgy 3

The Metallurgy of Copper and Lead: This course consists of lectures on the modern metallurgy of copper and lead. It discusses the types of copper and lead ores and the methods suitable for the treatment of the different types. The principles of the reverberatory process for copper are discussed in detail, as it brings out clearly the chemistry of copper. Matte smelting for copper ores is discussed, both pyrite smelting and ordinary matte smelting being taken up in detail; also the roasting of copper ores. This is followed by the discussion of the Bessemerizing of copper mattes and the electrolytic refining of blister copper. Wet

methods for copper ores are discussed. This is followed by a discussion of the blast furnace smelting of lead ores, including the roasting of ores, composition of lead slags, the products of the furnace, etc. The practice of large centrally located plants, treating both mixed lead and copper ores is taken up; also the reverberatory smelting of lead ores and the desilverization of lead ores, and the desilverization of lead bullion and the refining of lead. Laboratory work for this course is described under Metallurgy 7.

Senior Year, First Semester, eight weeks: Five lecture periods per week.

No text book required. Reference works: Hofman's Metallurgy of Lead; Peters' Metallurgy of Copper; Ile's Lead Smelting; Schnabel's Handbook of Metallurgy; Peters' Principles of Copper Smelting.

Metallurgy 4

The Metallurgy of Gold and Silver: This course consists of lectures on the metallurgy of gold-silver, taking up, first, modern stamp mill practice; discussing in detail, mortar boxes, stamps, screens, general battery construction, etc., and the influence of weight of stamp, screen mesh, mortar box dimensions, amount of water on results obtained. Inside and outside amalgamation is taken up in detail; the general mill arrangements; clean up; the influence of other processes following amalgamation is discussed. Modern fine grinding in tube mills and other apparatus is taken up. This is followed by a discussion of the cyanide process for gold and silver ores; wet and dry crushing; crushing in cyanide solution; the separation of sands from slimes; the treatment of sands by percolation; the treatment of slimes by decantation, filter pressing and vacum filtration; the precipitation of gold and silver by the various methods in use; methods of

cleaning up and the smelting of cyanide precipitates. The general chemistry of cyanidation and the proper performance of laboratory experiments is discussed. This is followed by lectures on the chlorination process, particularly on the roasting of gold ores both for chlorination and cyanidation; the chloridizing roasting of silver ores; pan amalgamation; leaching process for silver ores, etc., concludes the course. Laboratory work for this course is described under Metallurgy 7.

Senior Year, Second Semester, thirteen weeks: Five lecture periods per week. The remaining two weeks are given to a brief discussion of the metallurgy of zinc.

No text books required. Reference works; Julian & Smart's Cyaniding of Gold and Silver Ores; T. A. Richard's Stamp Milling of Gold Ores; Henry Louis' Handbook of Gold Milling.

Metallurgy 5

This is a course discussing in greater detail some of the features of Metallurgy 1. It comprises lectures on the physics and chemistry at high temperatures; pyrometry, including a discussion of the principles of the measurements of high temperatures by different methods; calorimetry, including the determination of calorific power of fuels, and the specific heats of slags, etc., and work in Metallography. The laboratory work for this course is described under Metallurgy 8.

Senior Year: Four lecture periods per week throughout the year.

(Note: Course 5 is a metallurgic option replacing Geology 4, in the regular mining engineering course. If the majority of the students who elect this work so desire, Course 5, instead of being as above will be replaced by lectures, dealing in detail with the metallur-

gy of gold, chiefly amalgamation and cyanidation, similar to Course 4, but greatly enlarged in detail and usefulness.)

No text book required. Reference works: Le Chatelier & Boudouard's High Temperature Measurements; J. H. Vogt's Silicat-Schmelz Losungen, etc., Volumes of the Metallographist, and other works.

Metallurgy 6

Assaying: This course is taught by lectures and by laboratory work, based on the lectures. Elementary chemistry, qualitative and quantitative analysis are pre-requisites, being necessary for a thorough understanding of the work.

The work of the laboratory includes assaying of reagents; the testing of ores to discover their nature; the study of oxidizing and reducing reactions occuring in assaying; the study of typical assay slags; the assaying of pure gold and silver ores by crucible and scorification methods; the special assaying of copper and zinc ores containing gold and silver; the assaying of arsenical and antimonial ores for gold and silver; the study of cupellation and the factors which influence its results; the assaying of impure ores by the roasting, the nitre, and the excess litharge methods; the assaying of telluride ores, lead bullion, and cyanide precipitates for gold and silver; the assaying of gold and silver bullion; the assaying of ores and alloys for platinum, iridium, etc.; the assaying of lead, tin, bismuth, and antimony ores for their respective base metals; the dry assay of mercury ores for mercury, and concentration and free milling tests on a laboratory scale.

Junior Year, Second Semester: Two lecture periods and nine laboratory hours per week.

Text book: Fulton's Manual of Fire Assaying.

Metallurgy 7

Metallurgical Laboratory: Laboratory practice in pyrometry; the calibration of the thermo couple; taking of cooling curves and freezing point curves; heat curves of furnaces; the examination of iron and steel and other alloys under the microscope; the preparation of metal sections for the microscope; the roasting of ores, noting the formation of sulphates, etc.; the desilverization of lead bullion by means of zinc; the electrolytic deposition of copper and lead; the roasting of gold and silver ores; experiments with the cyanide process, including the titration of pure and mill solutions with silver nitrate, analysis of cyanide solutions, cyanide experiments with small lots of ore in the laboratory to determine extraction, etc.; finally, at the end of the term, a mill run or smelter run on a large lot of ore.

SeniorYear: Frst Semester, six laboratory hours per week; second semester, three laboratory hours per week.

Text book: Clennell's Chemistry of Cyanide Solutions, and Howe's Laboratory Note Book.

Metallurgy 8

Metallurgical Laboratory: Laboratory practice in pyrometry, much more detailed than described for Course 7, including other pyrometers than the thermo couple; determination of calorific power of fuels by the bomb calorimeter; determination of the physical constants of slags, including their specific heat, melting points; microscopic examination of slags, mattes and other furnace products; the working out of metallurgical problems which may suggest themselves.

Senior Year: Three laboratory hours per week throughout the year.

Note: The note applying to Course 5, applies here also. The work of this course is accepted in part as thesis work.

Metallurgy 9

Metallurgical Thesis: Subject assigned by the professor in charge or chosen by the student.

Senior Year: First semester, three laboratory hours per week; second semester, six laboratory hours per week.

DEPARTMENT OF GEOLOGY AND MINERALOGY

PROFESSOR O'HARA MR. JEFFRIES.

Library, Laboratory and Field Facilities

A good, well equipped departmental library is placed convenient to the lecture and laboratory rooms and students are required to make intelligent use of the literature contained therein.

The laboratory equipment and the museum collections, elsewhere described, furnish indispensable material for practical work of many kinds.

Field facilities are unsurpassed. Unusual opportunity is afforded for study in the field of the various geological horizons, including important and valuable economic deposits. Within a few miles of the School the student may observe upturned strata of nearly all geological ages. Twenty miles southwest of Rapid City is the Harney Peak granite area, with its lavish variety of mineral specimens. Surrounding this is a wonderful exposure of Algonkian metamorphic rocks cut in many places by auriferous quartz veins. The Cambrian, Carboniferous, Triassic, Jurassic, and Cretaceous are extensively developed. The famous White

River Bad Lands of Tertiary age lie to the southeast of the Hills and afford fossils which have made the region known wherever the science of Paleontology is taught. In the northern part of the Hills important igneous rocks, such as rhyolite, phonolite, andesite, dacite, etc., occur in the form of dikes, sheets and laccoliths. Closely associated with these in slates, quartzites, and limestones, gold ores of the greatest importance are found.

In the autumn, short field excursions are made by the class to near-by points of interest and occasionally a visit of several days is made to more distant localities. Thus the student, in addition to lecture and laboratory instruction, has the advantage of systematically directed field study and with the information thus gained, he should be able to undertake for himself the working out of practical field problems.

Geology 1

General Geology: This course is arranged primarily as introductory to all work in geology and mineralogy. It extends throughout the Freshman year and embraces a comprehensive study of the fundamental principles of geology. The course includes brief, but careful study of dynamical, stratigraphical, structural, chemical, and historical geology, and is conducted by means of lectures, text books, and laboratory work, and frequent excursions to points of particular interest. Under dynamic geology, the atmospheric, aqueous, igneous, and organic agencies are discussed with reference to their bearing on the present and past condition of the earth's surface. Stratigraphical and structural geology consider the conditions of deposition of sediments and of the disturbance of rock masses. A portion of the time allotted to these subjects is devoted to the study of such minerals and rocks as enter most

largely into the structure of the earth's surface; also to the methods of geological surveying, including mapping, section making, special problems. Chemical geology includes the study of the general relation which chemistry bears to geological phenomena, such as the formation, metamorphism, and degeneration of rocks, and the origin and alterations of the various kinds of mineral deposits. Under historical geology, the physical history of the earth is discussed, the classification and distribution of sedimentary rocks studied, and the methods of correlation explained. The course aims to equip the student with useful information concerning the phenomena and history of the earth, so that he may know the methods used in geological research, and will better understand how to interpret facts gained in the study of economic deposits.

Freshman Year: Four lecture periods and three laboratory hours per week throughout the year.

Text Book: Chamberlain and Salisbury's Geology, Vol. I. Geologic Processes and Their Results.

Mineralogy 1

General Mineralogy: This course is planned to develop such information as may be needed for quick and accurate determination of mineral species in the field. The course is based on lectures, text book, and laboratory work and embraces frequent rigid quizzes on features of chief importance. The physical properties of minerals are dealt with in the early part of the course; a brief study of Crystallography introducing this part of the subject. This is followed by a careful physical study of the chief economic and rock-making minerals in systematic order. Good collections, containing most of the common species of minerals and many of the rare ones, are arranged for convenient use in the laboratory and museum. Thorough-

ly accurate observation of labeled specimens from many localities is insisted upon, and every attention is given to simple, practical methods in the determination of unknown materials.

Sophomore Year, First Semester: Three lecture periods of three laboratory hours each week.

Text Book: Moses and Parson's Mineralogy, Crystallography, and Blowpipe Analysis.

Mineralogy 2

Blowpipe Analysis: This course is closely associated with Course 1 and continues the same object in view, i. e., the teaching of quick methods of mineral determination. It is chiefly a laboratory study, occupying one lecture period and six laboratory hours throughout the second semester of the Sophomore year. Approximately the first third of the semester is devoted to the study of blowpipe methods, known minerals being chiefly used. After this, the student is given only unlabeled specimens, the nature and name of which he is required to learn, keeping for reference a detailed record of all results obtained during the process of determination. It is expected that, upon completing this and the preceding course, the student will have gained a fair working knowledge of approximately two hundred of the common minerals, including the chief features of their distribution, uses, value and output.

Sophomore Year, Second Semester: One lecture period and six laboratory hours per week.

Text book: Brush-Penfield's Determinative Mineralogy and Blowpipe Analysis.

Geology 2

Physical Geology, including Metamorphism. The purpose in this course is to bring out in some detail, certain important features, too briefly considered in

General Geology, that have close connection with the subject of Petrography and Economic Geology which follow. Processes of disintegration, denudation, and deposition, crustal disturbances, and metamorphic influences receive attention, particularly with reference to their immediate or ultimate relation to ore formation. The physical action of underground water commands careful study, and where physical phenomena are closely connected with chemical activity, the chemical processes in the influencing of mineral reorganization receive proper consideration. In this, as well as in all other courses described, features of economic importance will receive particular attention, but it should be understood by the student, that the full aim of the course is to afford opportunity for as thorough and comprehensive a grasp of the subjects in hand as the time devoted to them will allow.

Junior Year, First Semester, Three lecture periods and three laboratory hours per week.

Text Book: Lecture notes.

Geology 3

Petrography; This course is intended especially for mining students who need some training in rock determination, but who have opportunity to devote only a brief time to the subject. It embraces the macroscopic and microscopic study of specimens and is conducted by means of lectures, text books, and laboratory work. The lectures are devoted to the discussion of petrographical methods, the nomenclature of rock species, the principles of rock classification, and the origin, distribution, modes of occurrence, alterations and relations of rock masses. The laboratory work embraces the study of hand specimens of rocks the making of thin rock sections and the examination of such sections by means of the petrographical micro-

scope. Little more than a short summary is given of the refined methods of microscopic analysis, most of the time being devoted to the simpler field methods of determining and classifying the commoner rock types. Two good Zeiss petrographical microscopes, together with necessary accessories, are available for use. There is also a Krantz collecton of 350 rock types in hand specimens and in thin sections, and a fairly complete series of Black Hills rocks, a number of which have been thin sectioned for study.

Junior Year, Second Semester: Three lecture periods and three laboratory hours per week.

Text Book: Kemp's Handbook of Rocks.

Geology 4

Economic Geology: This course runs throughout the Senior year and includes study of the origin, modes of occurrence and uses of economic mineral products. Beginning with this year, about one-half of the first semester will be given to the study of non-metallic products. This will include the origin, nature, relations, and value of coal, petroleum, natural gas, salines, building stone, clays, cement, materials, fertilizers, abrasives, gems, etc. The rest of this course will be devoted to the study of metallic products, such as gold, silver, copper, iron, lead, zinc, platinum, mercury, nickel, etc. In this much attention is given to the study of the principles of ore deposition and to the historical development of the theories connected therewith. Careful attention is given to the chief types of deposits and particularly to localities noted for their wealth of output.

Maps, specimens, and original papers are freely used. Attention is given to the history of mineral development, of the life and comparative importance of various regions and of the influence which economic

deposits have exerted upon the regions or countries in which such deposits have been found.

The necessity of individual examination by the student of the best up-to-date literature is insisted upon, and a reasonable ability to properly use such literature is required. Much attention is devoted to the study of the many economic interests of the Black Hills region and observation of the deposits in the field is encouraged.

Senior Year: Four lecture periods per week throughout the year.

Reference Texts: Beck-Weed's Nature of Ore Deposits; Ries' Economic Geology of the United States; Kemp's Ore Deposits of the United States and Canada.

DEPARTMENT OF ENGINEERING

PROFESSOR O'BRIEN.

The aim of this department is to give the student such training in the class room, drawing room and field as will properly fit him for his career as a mining engineer.

The department occupies two well lighted drawing rooms, 24x34 and 24x30 feet in size; lecture room and offices. The rooms are furnished with suitable drawing desks which have separate lockers for each student.

The work of this department extends over a period of three years and includes the following courses:

Engineering 1

Mechanical Drawing: Practical work in the drawing room accompanied by lectures as needed. The work is carried on chiefly by means of individual instruction The course includes the care and use of instruments; the mounting of sheets; simple geometric construction; orthographic projecton; and both free hand and mechanical lettering of titles.

Students taking this course should provide themselves with the following list of supplies, most of which may be obtained from the supply room of the department at cost:

One set of drawing instruments containing:

One pair of 6-in. Compasses, with pen, pencil and needle points.

One pair 6-in. Dividers.

One 5 1-2 in Ruling Pen.

One 3 1-2 in. Steel Spring Bow Divider.

One 3 1-2 in. Steel Spring Bow Pencil.

One 3 1-2 in. Steel Spring Bow Pen.

One T Square with 30 in. blade.

One 4 1-2 in. Protractor.

Two Irregular Curves, (Dietzgen, No. 10 and No. 19.)

One 7 in. 30 deg. by 60 deg. Triangle.

One 8 in. 45 deg. Triangle.

One 6H Drawing Pencil.

One Pencil Pointer.

One Pencil Eraser.

One Ink Eraser.

One Sponge Rubber.

One dozen Thumb Tacks.

One Pulp Board.

Eighteen sheets Whatman's H. P. 17x22 in. Drawing Paper.

One bottle Mucilage or Glue.

One bottle Black Drawing Ink.

One bottle Red Drawing Ink.

Drawing boards and key for locker are furnished by the School on the payment of a fee of $1 per year; 50 cents of this is refunded on return of key.

Freshman Year: Six laboratory hours per week throughout the year.

Text Books: Morris' Geometric Drawing for Art Students' Alphabets.

Engineering 2

Descriptive Geometry: The work in descriptive geometry is necessary in order that the second and third year drawing may be done intelligently. The course is taken up as outlined in Hall's Descriptive Geometry. It includes the projection of the point and line and the representation of planes and problems relating thereto; generation, classification and intersection of surfaces.

Sophomore Year: One lecture period per week throughout the year.

Text Book: Hall's Descriptive Geometry with Plates.

Engineering 3

Mechanical Drawing: This course is supplementary to the class room work of descriptive geometry and mechanism. The work of this course takes up the development and intersection of plane and curved surfaces. It is designed to run parallel to the course in mechanism, consequently it includes the drawing of cams and gear teeth and analysis of link work.

Sophomore Year: Six laboratory hours per week throughout the year.

Text Book: Reed's Mechanical Drawing .

Engineering 4

Mechanism: This course is given by means of lectures and recitations. The work takes up laws which govern the moving parts of the machine; the design of cams, gear teeth, and link work. The various parts of the machine are discussed in the class room and then are carefully and accurately constructed

on the drawing board so that the student may gain a clear idea of the design of the various mechanical movements. This course furnishes a basis for the work of Engineering 3 in the second semester of the Sophomore year.

Sophomore Year, Second Semester: Two lecture periods per week.

Text Book: Stahl & Wood's Elementary Mechanism.

Engineering 5

Mechanical Drawing: This course is for the purpose of giving instruction in methods of representing machine parts. The student is required to make free hand sketches of various parts and then make from his sketch a finished working drawing, properly lettered and dimensioned. Tracing and blue printing are part of the course.

Junior Year, First Semester: Six laboratory hours per week.

Engineering 6

Professor Ehle.

Graphical Statics: The object of this course is to give an understanding of the theory of the graphical solution of internal stresses in a framed structure, arising from steady and moving loads, from the pressure of the wind, etc. The student is required to determine by graphical methods on the drawing board, the nature and amount of internal stresses in the various members of such simple roof and bridge trusses and head frames as are assigned him.

Junior Year, First Semester: One lecture period and three laboratory hours per week.

Text Book: Hosking's Elements of Graphical Statics.

Engineering 7

PROFESSOR EHLE

Surveying: It is the desire of the department to bring, as far as it is practicable, theory and practice side by side. For this reason, the discussions in the class room are confined to such principles as can be given a practical application in the field or drawing room.

The institution is provided with all the instruments and accessories necessary to carry on the work. Additional instruments are purchased as the need for them arises.

For the performance of the field work, the class is divided into squads with just a sufficient number in each to properly carry on the work. Each student is required to take his turn at every part of the work; to use each instrument as the occasion demands; to make his own notes and computations; and finally to accurately plot them in the drawng room.

The course outlined is as follows: Linear measurements by means of pacing and chain or tape; adjustment and use of the engineer's transit and level; traversing; principles of land surveying; adjustments and use of the plane-table; mine surveying, including the location and patent surveying of claims; shaft plumbing and underground connections; adjustment and use of the solar instrument; geodetic surveying including the measurement of a base line; measurement of the horizontal angles; computations for the adjustment of the triangulation system; determination of the meridian by means of the solar instrument; determination of latitude; direct solar observation and observation on Polaris; measurements of volumes. Railroad surveying will receive as much time as the conditions will permit.

Sophomore Year: First semester, three lecture periods and three hours field work per week. Second semester, two lecture periods and three hours field work per week.

A two weeks summer school for practical work immediately follows the close of school in June, and completes the course in surveying.

Text book: Johnson's The Theory and Practice of Surveying.

Engineering 8

Hydraulics: The student takes up this course with a knowledge of hydrostatics from his work in Physics 3, and is thus prepared to commence with hydraulics proper, or the study of the laws governing the motion of water. He learns the methods of commercial measurement of water by both weir and orifices. The problems include the computation of diameters of pipes; pressures, and energy of confined water; dimensions of channels and ditches; velocity of flow, etc.

The School is favorably situated for field work in hydraulics. Rapid Creek is a mountain stream with a fall of about 1.6 per cent., offering splendid facilities for weir and velocity measurements; two large irrigation ditches are adjacent to the School, and Rapid City has three water-power plants within the city limits. The students thus have opportunity to visit and study hydraulic power plants in successful operation.

In the latter part of the course the student designs and makes drawings for a complete water-power plant, calculating the size of flumes and ditches, cost of material and excavation; makes plans for wheels, tail-race, etc., as a practicing engineer would be required to do.

Senior Year: Two lecture periods per week through-

out the year. Second semester, three laboratory hours per week.

Text book: Mansfield Merriman's Treatise on Hydraulics.

Engineering 9

Thermo-Dynamics: This course begins with a discussion of the theory underlying the operation of heat engines. The theory of the operation of the ideal engine is developed, and the principles governing the actions of steam and gas engines, air compressors and refrigerating machines are fully discussed.

Senior Year: First semester, two lecture periods per week.

Engineering 10

Design of Power Plants: This course applies practically the principles developed in the preceeding one. It embraces the history of the development of the steam engine, and a study of the types in successful use; the application of the indicator and Prony brake, and testing of boilers and fuels.

The School has three 40 horse-power boilers and a 40 horse-power Corliss engine; also a gasoline and a kerosene engine. This apparatus is available for laboratory work in this line.

Under the head of hydraulics, the Seniors design a water power plant. (See hydraulics.) In this course the students learn to design the necessary electrical equipment to commercially transmit this power to distant points.

Senior Year: Second semester, two lecture periods per week.

Engineering 11

Strength of Materials: The resistance and elasticity of the materials of engineering; fundamental as-

sumptions of the common theory of beams; distribution of stresses in beams; shearing forces, bending moments, and deflections of beams; the common and exact theory of torsion, flexure, elastic limits; working stresses and ultimate stresses and ultimate resistance of cast-iron, wrought iron, steel, and timber; pipes and riveted joints; posts and columns; the design of posts, beams, shafts, etc.

Junior Year: Second semester, five lecture periods per week.

Text book: Merriman's Mechanics of Materials.

DEPARTMENT OF CHEMISTRY

PROFESSOR COOLBAUGH. MR. COOLIDGE.
MR. BETTERTON.

The courses in chemistry are designed to give to mining and to metallurgical engineers the knowledge of chemistry most essential to their work. Especial emphasis is given to the laws underlying the science; the separations, estimations, etc., being made with these principles in mind. The purpose is to excite in the student an interest in experimentation, to cultivate methods of accuracy and rapidity in manipulation, and to teach the proper correlation of the results of experiments.

Chemistry 2

General Chemistry: This course should give the student a knowledge of the principal theories and laws of the science. The following subjects are discussed in an elementary way: Atoms and molecules, gases, liquids, solids, solutions, thermo and electro-chemistry, and chemical equilibrium. Some time is also given to a study of industrial chemical processes, such as the manufacture of acids, alkalies, clay and cements, cyanides, gas and ammonia. In addition, there is a brief

study of the metallic elements, introducing elementary metallurgy when those of commercial importance are under consideration.

Freshmen Year: Three lecture periods per week throughout the year.

Reference books: Richter's Inorganic Chemistry; Ostwald's Principles of Inorganic Chemistry; Thorp's Outlines of Industrial Chemistry.

Chemistry 3

Qualitative Analysis: The class work in qualitative analysis begins with an outline of the general scheme of analysis. Then follows a minute study of the metals and the acid radicals with their detections and separations. Emphasis is placed on the principles of oxidation and reduction, the law of mass action and the theories of ionization and hydrolysis. Separations are made before the class in order to give an idea of the correct use of reagents and of the methods for rapid manipulation.

Freshman Year: Two lecture periods per week throughout the year.

Reference books: Prescott & Johnson's Qualitative Analysis; Treadwell's Qualitative Analysis.

Chemistry 4

Quantitative Analysis: The class work in quantitative analysis consists of: discussions of the relative merits of methods applied in the laboratory, the study of articles and reviews from chemical periodicals, and the subject of chemical calculations.

Sophomore Year: Two lecture periods per week throughout the year.

Reference books: Miller's Notes on Quantitative Analysis; Miller's Calculations on Analytical Chemistry; Treadwell's Quantitative Analysis; Sutton's Volumetric Analysis; Low's Technical Methods of Ore Analysis.

Chemistry 5

Metallurgical Chemistry: This course is to familiarize the student with the analytical methods used in conjunction with metallurgical processes. The subjects studied are: The technical methods connected with the metallurgy of iron, steel, zinc, lead, and copper; the determinations of bismuth, mercury, cadmium, tin, nickel, and the rare elements of commercial importance, and the analysis of electrolytic slimes.

Prerequisites, Chemistry, 2, 3 and 4, or equivalents.

Junior Year: One lecture period per week throughout the year. Required of Juniors taking the metallurgical option.

Chemistry 6

Qualitative Analysis, Laboratory: This covers the separation of metals and acids in solutions, dry mixtures, minerals, slags, and alloys. Numerous tests are made with the blowpipe, and the spectroscope is used for the detection of the alkali and alkaline earth metals.

Freshman Year: Nine laboratory hours per week throughout the year.

Chemistry 7

Quantitative Analysis, Laboratory: The course covers the subject of mineral analysis, including both gravimetric and volumetric methods. The analyses required are: Magnesium sulphate, sodium or other chloride, potassium alum, coal, iron ammonium alum, iron ore, pig iron, spiegel or manganese ore, zinc ore, copper ore or matte, brass, lead ore, chromic iron, limestone, arsenic ore, antimony ore, slag, and gas analysis,

Sophomore Year: Nine laboratory hours per week throughout the year.

Chemistry 8

Quantitative Analysis, Laboratory: Work corresponding to Chemistry 5.

Junior Year: Six laboratory hours per week throughout the year.

DEPARTMENT OF MATHEMATICS.

PROFESSOR MCLAURY.

The engineer, from the very nature of his work, must of necessity meet many difficult problems. His success will depend on his ability to solve them. As it is impossible to tell in advance just what experiences a given student will meet, that course is best which results in mental power. It is not a question of what the student has done, but what he can do. Has he a comprehensive grasp of the subject; has he thoroughly mastered the principles; can he apply these principles to kindred subjects?

The aim of this department will be to give the student a thorough knowledge of the principles of mathematics so as to enable him to apply them readily to the solution of practical problems. Original work is encouraged, and an effort is made to cultivate the habit of extra logical reasoning, and to stimulate independent thought. Both rapidity and accuracy are expected in all mathematical work. The great importance of mathematics as the basis of a scientific education justifies the requirements of all elementary courses, as a prerequisite to the Mining Engineering Course.

No course in Algebra is offered in the Engineering Department. However, in the following courses, particular pains will be taken to explain all the more difficult algebraic processes as they occur. Several subjects in higher algebra will be discussed, each at the point where it is required for immediate application. Students who

have not studied algebra for a year or more, should make a careful review before entering school, for a thorough knowledge of the elements of algebra is essential to the successful completion of all subsequent courses.

Mathematics 7

Trigonometry: Plane, analytical, and spherical, considerable attention is paid to the consistent and scientific development of the fundamental conventions and definitions, and to the derivation and transformation of trigonometric expressions. Many practical problems are solved.

Freshman Year: First semester, five lecture periods per week for sixteen weeks.

Text book: Phillips & Strong's Trigonometry.

Mathematics 8

Analytic Geometry: This course includes the following subjects: Loci; straight lines; transformation of co-ordinates; circles; conic sections; the general equation of the second degree and higher plane curves.

The theory will be developed by lectures.

Freshmen Year: Second semester, five lecture periods per week for eighteen weeks.

Text book: Nichol's Analytic Geometry, with Smith & Gale, Puckle, Ashton, and C. Smith for reference.

Mathematics 9

Differential Calculus: The text book work is supplemented by lectures. This course will include the discussion of a few subjects in higher algebra and will be preceded by a short course in solid analytic geometry, based on Nichol's Analytic Geometry.

Sophomore Year: First semester, five lecture periods per week.

Text book: Granville, Differential and Integral Calculus.

Snyder & Hutchinson, and Williamson are used for reference.

Mathematics 10

Differential and Integral Calculus: This course is a continuation of the last course and will include the most of the work in Osborn's Calculus.

Sophomore Year: Second semester, five lecture periods per week.

Mathematics 11

Mechanics: The theory is developed by lectures. The aim is to present the fundamental principles in as clear and simple manner as possible. Many problems will be solved to enforce the principles and to develop ability in the student to apply what he has learned to practical problems. Particular effort is made to cultivate the power of the student to use calculus methods when needed. The course includes the following subjects.

Statics: First principles; units, composition and resolution of concurring forces; composition and resolution of forces acting on a rigid body; conditions of equilibrium; center of gravity; friction; virtual velocities; machines; the funicular polygon and the catenary.

Kinematics: Rectilinear and curvilinear motion; composition and resolution of acceleration; angular velocity and angular acceleration; projectiles, etc.

Kinetics: Laws of motion; motion under the action of a variable force; motion in a resisting medium; constrained motion; the simple pendulum; centripetal and centrifugal forces. Impact; work and energy; moment of inertia.

Junior Year: First semester, five lecture periods per week.

Text book: Bowser's Analytic Mechanics; the works of Church, DuBois, Hoskins, Johnson, Lanza, Todhunter, and Routh, are used for reference in this and the following course.

DEPARTMENT OF PHYSICS

Mr. Van Nuys

The courses offered by the department are as follows:

Physics 3

Advanced Physics: The subjects treated in the first semester are: Mechanics, hydrostatics, sound, and light. The mechanics of fluids receives the benefit of much time and the complete treatment here serves as an introduction to the study of hydraulics in the Senior year. The work of the semester ends with a review of the principles of light, and a discussion of the spectroscope and polariscope. In the second semester the course is continued by treating the subjects, heat, electricity, and magnetism. In the subject of heat particular attention is given to the expansion of gases and vapors, special heat, and the relation of heat and energy, that the student may have a good foundation for thermodynamics.

The subject of electricity receives detailed and careful consideration. The laws of electrolysis, resistance, and potential are developed, and a comprehensive study of electrical measuring instruments, dynamos, motors, etc., is entered into. The relative advantages of alternating and continuous currents for different purposes is pointed out. This course gives the student good preparation for his subsequent work in mining and metallurgy.

Junior Year: Three lecture periods per week throughout the year.

Text book: Watson, Text Book of Physics.

Physics 4

Laboratory work in connection with Physics 3:

The aim of the laboratory work in this course is not so much to perform a large number of experiments, as to learn to work with care and accuracy. Determinations are made of the coefficient of friction; buoyancy of the atmosphere; acceleration of gravity, etc. Complete reports of all experiments are required, and when possible, they are accompanied by appropriate curves.

In the experimental work in heat, particular attention will be given to such practical determinations as the calorific power of fuels; melting and boiling points; and the expansion of vapors and gases.

The laboratory is well equipped for an extensive course in electrical testing. The apparatus includes a permeameter, magnetometer, condensers, induction coils, static machines, X-ray tubes, etc. Dynamos, motors, and lamps are available of the purpose of making tests of commercial efficiency. The school machine shop is at the disposal of students for the purpose of constructing apparatus for research work.

The general application of electricity to mining makes this course of value and interest to the mining engineer.

Junior Year: Three laboratory hours per week throughout the year.

DEPARTMENT OF ENGLISH

PROFESSOR MCLEARIE.

The aim of this department is to give the student a command of good idiomatic English and to aid him

in the development of the art of expression. Especial emphasis is laid upon the importance of good composition in technical work. Attention is called to the absolute necessity that every professional man should be able to express his thoughts with clearness and accuracy.

English 5

Composition 5: The elements of effective writing: This course gives both theoretical and practical instruction. The theory is taught by class room work based on standard text books. The practice is obtained by exercises, written in the class room, and by weekly themes. At least one theme a week is required, and every theme is returned to the student to be revised or rewritten.

Freshmen Year: Three lecture periods per week throughout the year.

Text books: Wendell's English Composition; Pearson's Principles of Expression.

English 6

Composition 6: This course supplements the work of the Freshman year by giving further practice in narrative, expository and argumentative writing. A study is made of the works of such authors as will aid in practical composition work. Three themes are required, each containing from 800 to 1,000 words. There will be a conference on each theme.

Sophomore Year: First semester, two lecture periods per week.

LIST OF STUDENTS IN MINING AND METALLURGICAL ENGINEERING

SENIOR CLASS.

Betterton, Jesse O. ..... Columbus, Neb.
Coolidge, R. F. ..... Omaha, Neb.
Hvistendahl, Eli A., A. B., U. of S. D..... Vermillion, S. D.
Jones, H. W., A. B.. U. of S. D..... Vermillion, S. D.
Ledyard, L. W..... Sioux Falls, S. D.
Marshall, Willard C..... Rapid City, S. D.
Read, Herbert N. ..... Rapid City, S. D.

JUNIOR CLASS.

Bennett, R. T. ..... Pierre, S. D.
Elliott, J. W. ..... Columbus, Neb.
Eddy, J. W. ..... Helena, Mont.
Flower, G. E. ..... Akron, Ohio
Hartgering, McRae ..... Rapid City, S. D.
Hunter, George R. ..... Deadwood, S. D.
Jeffries, Zay ..... Ft. Pierre, S. D.
Sargent, A. E. ..... Rapid City, S. D.
Stoner, J. W. ..... Lincoln, Neb.
Saville, Joseph ..... Custer, S. D.
Wheelock, H. E. ..... Rapid City, S. D.

SOPHOMORE CLASS.

Anderson, Wm. L. ..... Rapid City, S. D.
Adams, C. W. ..... Mitchell, S. D.
Brooks, Floyd ..... Rapid City, S. D.
Ballard, Peter ..... Rapid City, S. D.
de Groot, George R. ..... Salt Lake City, Utah
Ehle, C. G. ..... Marshalltown, Iowa
Mosier, Peter ..... Rapid City, S. D.
Nash, W. H. ..... Webster, S. D.
Quinney, Elwin H. ..... Alexandria, S. D.
Willard, C. G. ..... Rapid City, S. D.

FRESHMAN CLASS.

Atkins, Walter C ..... Columbia, S. D.
Blynn, Raymond L. ..... Mitchell, S. D.
Conway, C. L. ..... Hampton, Iowa
Dickey, S. D. ..... Spearfish, S. D.
Dunn, R. H. ..... Stickney, S. D.
Fahrenwald, Frank ..... Rapid City, S. D.
Halley, S. Russell ..... Rapid City, S. D.
Munn, Wm. ..... Deadwood, S. D.
Mara, Hubert ..... Rapid City, S. D.
Newport, G. H. ..... Bisbee, Ariz.
Tolson, Wm. H. Jr. ..... Baltimore, Md.
Keliher, Jack ..... Rapid City, S. D.
Stanley, Ward ..... Hot Springs, S. D.

SPECIAL STUDENTS. (Mining.)

Arpeno, Louis ..... Rapid City, S. D.
Burnham, A. ..... Deadwood, S. D.
Nelson, Ole ..... Rapid City, S. D.
Nyswanger, Lillian ..... Rapid City, S. D.
Price, H. B. ..... Forest, Ohio

ALUMNI OF THE SOUTH DAKOTA SCHOOL OF MINES

EIGHTEEN HUNDRED EIGHTY-EIGHT.

John W. Hancher, B. S., M. A., President Iowa Wesleyan University, Mt. Pleasant, Iowa.

EIGHTEEN HUNDRED NINETY.

Carrie Fiegel, B. S., Rapid City, S. D.

Benjamin Poznansky, B. S., Western Representative, Gerhard-Mennen Chemical Co., Newark, N. J.

Eva Robinson, B. S., M. A., Assistant Dean of Women, University of Chicago, 6056 Monroe St., Chicago, Ill.

EIGHTEEN HUNDRED NINETY-ONE.

Ottilie H. Behrens, B. S., Rapid City, S. D.

NINETEEN HUNDRED ONE.

G. Howell Clevenger, B S., E .M., S. D. School of Mines; M. A., Columbia University. Metallurgical Engineer, with Charles Butters, San Francisco, Cal.

Max Hopkins, B. S., with International Correspondence School of Scranton, Pa. Address, 1651 Jefferson Ave., St. Louis, Mo.

NINETEEN HUNDRED TWO.

Areli C. Overpeck, B. S., E. M., Superintendent Dakota-Calumet Mining Co., Hill City, S. D.

C. C. Thompson, B. S., E. M., United States Deputy Mineral Surveyor for Nevada, Goldfield, Nev.

NINETEEN HUNDRED FOUR.

U. S. S. Arentz, B. S., E. M., Superintendent Nevada-Douglas Copper Co., Yerrington, Nev.

Arthur E. Hall, B. S., Met. E., Assistant Superintendent, Copper Department, American Smelting & Refining Co., Omaha plant.

Elmer W. West, B. S., M. E., Instrument Man., Office of Engineer on special work, U. P. R. R. Co., 412 Ware Block, Omaha, Nebr.

Guy E. Wolcott, B. S., Mining Engineer, Golita, California.

Nineteen Hundred Five.

O. Allen Anderson, B. S., E. M., Instructor in Metallurgy, South Dakota School of Mines, Rapid City, S. D.

James Halley, Jr., B. S., Cashier Keystone Bank, Keystone, S. D.

Hollis W. Overpeck, B. S., E. M., Metallurgist, Buckskin Mountain Copper Co., Fredonia, Ariz.

Nineteen Hundred Six.

Louis L. Penhoel, B. S., Superintendent, McCandaless Development Co., Atlantic City, Wyo.

Peter Whytock, B. S., Consulting Engineer, Key Gold Mining Co., 60 State St., Boston, Mass.

William Gaines, B. S., with Standby Mining Co., Rochford, S. D.

B. D. O'Brien, E. E., Rose Polytechnic, 1896; B. S., S. D. School of Mines; Professor of Engineering, South Dakota School of Mines, Rapid City, S. D.

Frederick Wetherald, B. S., Mining Engineer, Cable, Mont.

Earl Van L. Smith, B. S.

Edwin Coolidge, B. S., E. M., Mill Chemist, Kendall Gold Mining Co., Kendall, Mont.

Herbert Seiter, B. S., Mining Engineer, Omaha, Nebr.

Harry T. Curran, B. S., E. M., Assayer, Metallurgist, Guadalajara, Mexico.

J. Burns Read, B. S., E. M., Assistant Superintendent, Arema Gold Mining Co., Georgetown, British Guiana.

Nineteen Hundred Seven.

Frank Bryant, B. S., with Kendall Mining Co., Kendall, Mont.

Frank Anderson, B. S., Assayer and Chemist, Lucky Strike Mining Co., Novek, S. D.

Wharton Cornell, B. S., 1711 Rodney St., Wilmington, Del.

Otto Ellerman, B. S., Northwestern Mining & Development Co., Atlantic City, Wyo.

Bernard Matson, B. S., Assayer, Portland Mining Co., Greenmont, S. D.

Lloyd Mellinger, B. S., Assayer and Chemist, Mountain Copper Co., Martinez, Calif.

Milton Morris, B. S., with Independence Mining Co., Victor, Colo.

C. C. Van Nuys, A. B., Yankton College; B. S., S. D. School of Mines; M A., Columbia University; Instructor in Physics, South Dakota School of Mines, Rapid City, S D.

Charles Whitmore, B. S., Cashier Lincoln County Bank, Canton, S. D.

Leon Peck Wells, B. S., Engineer, Calumet & Arizona Mining Co., Box 1433, Bisbee, Ariz.

NINETEEN HUNDRED EIGHT.

Cyril Cooledge, B. S., Assistant Superintendent, Bishop Creek Mining Co., Bishop, Calif.

L. L. Hebblethwaite, B. S., 907 Lake St., Evanston, Ill.

Glen P. Ives, B. S., Mill Superintendent, Vera Cruz Mining Co,, Nogal, N. Mex.

Lem. S. Overpeck, B. S., with Dakota-Calumet Mining Co., Hill City, S. D.

D. C. Woodward, B. S., Reliance Mining Co., Deadwood, S. D.

Fred W. Winters, B. S,, Salt Lake City, Utah.

W. G. Sparling, B. S., Rapid City, S. D.

Ignacio Diaz Ossa, B. S., Assayer and Metallurgist, Casilla, 962, Santiago de Chile.

Ivan E. Goodner, B. S., with C. E. Bogardus & Co., 90 Columbia St., Seattle, Wash.

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SOUTH DAKOTA STATE

SCHOOL of MINES

RAPID CITY, SO. DAKOTA

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OCTOBER.

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..	..	..	..	..	..	..

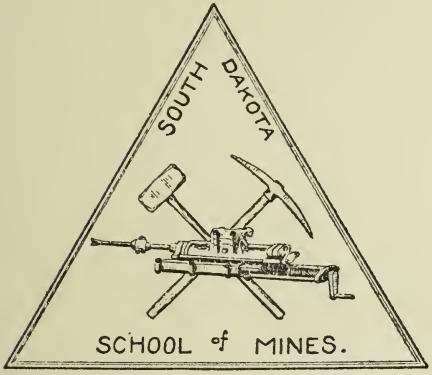
NOVEMBER.

S	M	T	W	T	F	S
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	..	..
..	..	..	..	..	..	..

DECEMBER.

S	M	T	W	T	F	S
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	..	..	..	..	..	..

THE SOUTH DAKOTA STATE SCHOOL OF MINES



ANNUAL CATALOG
1910-1911

1910
The Rapid City Daily Journal
Rapid City, South Dak.

COLLEGE CALENDAR

School Year begins.....Wednesday, September 14, 1910
Entrance Examinations begin.....September 12, 1910
Registration Committee considers applications for Advanced Standing and Credentials for Admission without examinations.....September 13, 1910
Thanksgiving Day recess.....November 24
.....to November 28, 1910
Christmas vacation.....December 21, 1910
.....to January 4, 1911
Examination week.....January 23 to
.....January 28 inclusive, 1911
First Semester ends.....January 28, 1911
Second Semester begins.....January 30, 1911
Washington's Birthday Anniversary...February 22, 1911
Spring recess.....April 10 to April 17, 1911
Examination week.....May 22 to 27, inclusive, 1911
Baccalaureate Sermon.....May 28, 1911
Memorial Day.....May 30, 1911
Faculty and President's Reception.....May 31, 1911
Commencement and Conferring of Degrees..June 1, 1911
Second Semester ends.....June 2, 1911

REGENTS OF EDUCATION

MEMBERS OF THE BOARD

THEODORE W. DWIGHT, Sioux Falls,
Term expires January 1, 1915.
A. E. HITCHCOCK, Mitchell,
Term expires January 1, 1915.
*E. C. ERICSON, Elk Point,
Term expires January 1, 1913.
A. J. NORBY, Sisseton,
Term expires January 1, 1913.
ALBERT M. ANDERSON, Sturgis,
Term expires January 1, 1911.

OFFICERS OF THE BOARD

*E. C. ERICSON, President, Elk Point.
IRWIN D. ALDRICH, Secretary, Big Stone,
GEORGE G. JOHNSON, (State Treasurer),
Treasurer Ex-officio.

REGENTS' COMMITTEE IN CHARGE OF THE SCHOOL OF MINES

A. M. ANDERSON A. E. HITCHCOCK

*Deceased, February 7, 1910.

FACULTY

Charles Herman Fulton, President and Professor of Metallurgy.
E. M., Columbia University.

Cleophas Cisney O'Harra, Professor of Mineralogy and Geology.
A. B., Carthage College, Ph. D., Johns Hopkins University.

Howard Lincoln McLaury, Professor of Mathematics.
A. B., Oberlin College. A. M., Harvard University.

Mark Ehle, Jr., Professor of Mining.
E. M., Colorado School of Mines.

Melville Fuller Coolbaugh, Professor of Chemistry.
B. S., Colorado College. A. M., Columbia University.

Claude Cornelius Van Nuys, Professor of Physics.
A. B., Yankton College; B. S., E. M., South Dakota State School of Mines; A. M., Columbia University.

Joseph Herbert Steele, Professor of Engineering.
B. S., Michigan Agricultural College.

John McLearie, Professor of English.
A. B., Macalester College; A. M., University of Chicago.

Clarence Leslie Lewis, Lecturer on Mining Law.
University of Michigan.

Howard Magill German, Instructor in Metallurgy.
B. S., Pennsylvania State College.

Christian Trygstad, Instructor in Modern Languages and History.
A. B., St. Olaf College; A. M., University of Minnesota.

*————————, Instructor in Preparatory Science and Mathematics.

Della May Haft, Librarian.
Ph. B., University of Chicago.

Lulu Quist, Registrar and Secretary to the President.

Zay Jeffries, Assistant in Geology.

Harry E. Wheelock, Assistant in Geology.

William L. Anderson, Assistant in Chemistry.

J. William Stoner, Assistant in Assaying.

*To be filled.

OTHER EMPLOYES

William A. Coursen, Superintendent of Grounds and Buildings.

Mrs. A. O. Anderson, Janitor.

Frank Boyd, Fireman.

STANDING COMMITTEES OF THE FACULTY

Committee on Admission and Registration:

Professor McLaury
Professor Ehle
Professor Coolbaugh
Professor McLearie

Committee on Emergencies and Discipline:

Professor O'Harra
Professor McLearie
Professor Ehle
Professor McLaury

Committee on Course of Study:

Professor Ehle
Professor O'Harra

Committee on Catalog and Publications:

Professor Van Nuys
Professor Steele

Committee on Library:

Miss Haft
Professor Van Nuys
Professor Coolbaugh

Committee on Athletics:

Professor Steele
Professor McLearie
Mr. Trygstad

Committee on Student Organizations:

Professor Coolbaugh
Professor McLearie

Committee on Theses:

Professor Coolbaugh
Professor O'Harra
Professor Steele

The Board of Control of the Athletic Association:

Professor Ehle, Chairman
Mr. Joseph Saville, Secretary
Professor McLearie
Professor Fulton
Mr. C. L. Conway
Mr. C. G. Willard
Rev. George S. Keller

The regular meeting of the faculty is held on the first Monday of each month.

GENERAL STATEMENT

Establishment of the School

The School of Mines is a state educational institution, and is at the present almost wholly maintained by appropriations of the State Legislature. It is endowed with 40,000 acres of land, lying in the State of South Dakota, and a grant from the federal government. It receives a comparatively small income from the rental of these lands, which are, however, steadily increasing in value. The school is under the Regents of Education. The regents, five in number, are appointed by the governor, confirmed by the senate, and have control of the various public institutions of learning maintained wholly, or in part, by the State as State Institutions.

The following is an extract from the act of the legislature, establishing the School of Mines:

Section 1. (School of Mines Established.) That a School of Mines for the Territory of Dakota be established at Rapid City, in Pennington County, Dakota Territory. It shall be the object of such School of Mines to furnish facilities for the education of such persons as may desire special instruction in Chemistry, Metallurgy, Mineralogy, Geology, Mining, Milling, Engineering, Mathematics, Mechanics, Drawing, the Fundamental Laws of the United States, and the Rights and Duties of Citizens.

Approved March 7, 1885.

HISTORY AND AIM OF THE SCHOOL

The chief aim of the State School of Mines is to offer young men a thorough education in mining and metallurgical engineering, believing that thereby the exploitation of the mineral resources of the State will be aided. Whenever it is possible, the School also aids the development of the mineral resources by the investigation of mining and metallurgical problems which arise in the state. At the present time, many graduates of the School are employed in responsible

positions in the Black Hills and throughout the West generally, and are doing much toward the developing of the State's mineral wealth. It is well known that the successful exploitation of the Cambrian ores of the Black Hills was due in a large measure to the experiments performed at the State School of Mines. This refers particularly to the chlorination process and to sulphide smelting. The School issues, from time to time, bulletins treating of Black Hills economic geology, and of mining and metallurgical methods, which can be obtained by those interested, upon request.

The first building of the School was erected in 1885, and is a three-story brick structure in which were originally, chemical and assay laboratories, and class rooms. The staff of instructors was necessarily small and the course by no means complete. The School, however, under able management, steadily though slowly gained in reputation, and, in 1887, erected a second building to serve the purpose of a metallurgical laboratory. This building is 138 by 60 feet in size, and was fitted with metallurgical and mining experimental machinery. In 1901 what is now the Main Building of the School was erected, the legislature appropriating $20,000 for that purpose. In 1903 another $20,000 was appropriated by the legislature for an addition to the Main Building, and $5,000 was appropriated for the construction of a separate heating plant. In 1905, $8,000 was appropriated for the improvement of the metallurgical laboratory, and extension of the heating plant, etc., in 1907, $15,000 for additions to the metallurgical laboratory, and in 1909, $8,000 for extension of heating plant and improvements to the metallurgical laboratory.

The number of buildings and equipment, at the present time, is such as to give good facilities for thorough instruction in mining and metallurgy, and allied subjects.

LOCATION

The School of Mines is located in Rapid City, in the foot hills of the Black Hills of South Dakota. It is on the Chicago & Northwestern Railway, on that branch extending from Omaha to Deadwood and Lead, South Dakota. Rapid City has direct connection with the eastern part of the state, by means of a branch of the same railroad from Pierre; and also by the Chicago, Milwaukee & St. Paul Railway from Chamberlain, South Dakota. It has also connection with the Burlington system by means of the Rapid City, Black Hills & Western Railway from Rapid City to Mystic.

Rapid City is a growing city of about 5,000 inhabitants. It was founded in 1876 and is the most beautifully located city in the Black Hills. It is situated on Rapid Creek, and a half hour's walk takes one either out on the plains or into the hills. It has large stores of all kinds, and living is comparatively cheap for a western town. It offers many advantages as a college and residence city. It has seven churches, representing practically all the principal denominations. There are costly water works fed by springs, four miles back in the hills; also a modern illuminating gas works and an electric lighting plant, furnishing the city with light, and a modern sewer system.

The elevation of the city is 3,200 feet above sea level and the climate is a very healthful one, the winters being usually mild and the summers cool. The climate is dry, the average rainfall being about 20 inches.

There is much social life in the town, and students after becoming acquainted, may enjoy the influences of home life. The students of the School find board and lodging in the homes, as the School does not maintain a dormitory.

The distance to Deadwood is only 46 miles and

but a little more into the heart of the great producing mining section of the Hills. The mining districts of Keystone, etc., are within 25 miles of Rapid City. It was thought desirable to locate the School at some distance from the active mining region, rather than directly within it, for it is now realized in technical education that the teaching of the fundamental sciences must be thoroughly accomplished before their technical application can be considered. If the School were located directly within the bustle of the mines and mills, it is very probable that, to some extent, the extremely practical surroundings might interfere with proper methods of study of the preliminaries.

In the last two years of the course, many visits are made to the active mining districts for the purpose of a close study of the methods in vogue. It is the intention, within the next year or so, to establish a summer school of mining to last six to eight weeks, in order to give the student a still more practical acquaintance with mining and metallurgical methods.

The location of the School is very favorable for the study of Geology. The Black Hills have long been known to afford remarkable facilities for the field study of Geology, in that the rocks of practically all ages are exposed in the uplift of the Black Hills. The great eruptive district of the northern Hills afford fine opportunities for this branch of Geologic study.

Close to the School, within a few hundred yards, is the pyritic smelting plant of the Standard Smelting Company, which treats the ores from the surrounding districts. It smelts ores, collecting the values into a matte which is shipped to other plants for refining. This plant affords the more advanced students in Metallurgy every facility for an intimate study of a very interesting process. The management of the plant extends every courtesy to the students of the School of Mines.

BUILDING AND EQUIPMENT

Buildings and Grounds

The buildings in which the work of the School is carried on are three in number: First, the original School of Mines building, a commodious brick structure, three stories in height, situated in the west part of the grounds, and at the present time devoted entirely to the Preparatory Department, in which students, found deficient in studies for entrance into the School of Mines, are properly prepared. It contains a large assembly room and class rooms for the study of languages, mathematics, history, and a laboratory for biology. It is heated throughout by steam, furnished from the central power plant, and is lighted by electricity.

In the center of the grounds is the main building of the School, a large brick structure, with native sandstone trimmings, three stories in height, built in two wings in the shape of a T. This building contains in the front wing, on the first floor, a large entrance hall, a Geological Museum, class rooms in Mathematics and English, the President's and the Registrar's offices. On the second floor are chemical laboratories, comprising the general, qualitive and quantitive laboratories, and offices and class rooms of the Department of Chemistry. The basement of the building contains the physical laboratory, store rooms and a lunch room. The first floor of the rear wing of the main building contains the Library and the balance of the Department of Geology and Mineralogy, consisting of class rooms and offices, and a thoroughly equipped mineralogical laboratory. The second floor contains the Department of Engineering, consisting of instructor's offices, two large drawing rooms for the Freshmen and Sophomore classes respectively, a large lecture room, and a thoroughly

equipped room for making blue prints. In the basement of this wing is a well equipped machine shop and store rooms. The machine shop serves the purpose of enabling the School to make a very appreciable amount of apparatus for scientific work as the occasion for its construction arises.

East of the Main Building is the Metallurgical Laboratory Building, 138 feet by 60 feet in plan, two stories in height, built of red brick with stone trimmings. This building is devoted exclusively to the Department of Mining and Metallurgy. It contains, on the first floor, a large chemical laboratory for advanced metallurgical chemistry, a well equipped balance room, containing massive concrete piers for the mounting of balances, private chemical laboratory and supply room, assay laboratory and a large assay furnace room. In the rear of the assay furnace room is the metallurgical laboratory containing mining and metallurgical machinery and apparatus.

On the second floor are located the lecture rooms of the Department of Mining and Metallurgy, offices of these departments, and a Mining and Metallurgical Museum.

On the east part of the school grounds is located the central heating plant, containing boilers, etc., which supply the three large buildings mentioned with heat, and the metallurgical laboratory with power. It is built of stone and has adjoining sheds with a large capacity for the storage of coal.

EQUIPMENT

In general, the School is well equipped to carry on its work. It has the essential of modern scientific technical instruction, ample laboratory facilities in all required branches.

LIBRARY

The library of the South Dakota State School of Mines is made up of standard works in Metallurgy, Mining, Geology, Chemistry, Engineering, Physics, Biology, English, History, Economics, and many works of a general nature.

The library and reading room occupy a large, well lighted and well equipped room on the first floor of the annex to the Main Building.

In this room is also placed a library of 400 volumes of a miscellaneous nature which the Rapid City Library Association loans the School.

On the reading tables are found the best journals on Mining, Metallurgy, Geology, Chemistry and Engineering, as well as magazines of a more general interest.

The following journals are on file:

Mining and Scientific Press.
Engineering and Mining Journal.
Mines and Minerals.
Mining Magazine, London.
Mining Science.
The Analyst.
Columbia School of Mines Quarterly.
Bulletins, American Institute of Mining Engineers.
Bulletins, Institution of Mining and Metallurgy.
Journal, Chemical, Metallurgical and Mining Society of South Africa.
Journal of Society of Chemical Industry.
Industrial and Engineering Chemistry.
Metallurgie.
Chemical Engineer.
Economic Geology.
Bulletins, Geological Society of America.
Journal of Geology.
Geologisches Zentralblatt.
Engineering News.
Engineering Magazine.

American Journal of Science.
Journal, American Chemical Society.
American Chemical Journal.
Journal of the Society of Chemical Industry.
Electro-Chemical and Metallurgical Industry.
Mining World.
National Geographical Magazine.
Zeitschrift der Anorganischen Chemie.

The reference works contain, among others, complete or partial sets of bound volumes of the following publications:

Transactions American Institute of Mining Engineers.
Transactions Institution of Mining and Metallurgy.
Engineering and Mining Journal.
Mining Reporter.
Bulletins, Geological Society of America.
Journal, Chemical, Metallurgical and Mining Society of South Africa.
Journal of Geology.
American Geologist.
The Mineral Industry.
Bulletins of U. S. G. Survey, and others.
American Journal of Science.
Proceedings of the Royal Society of London.

The library contains all of the chief books bearing directly upon the work of the respective departments. They are readily acessible to the student. The card system of cataloging is in use.

DRAWING ROOMS

In the Department of Engineering are two large drawing rooms—one for Freshmen and Sophomore work, the other for Junior work.

The rooms are fitted with especially designed drawing desks, each desk containing lockers in which students take care of their supplies. The drawing rooms are well lighted by many windows. Adjoining the Freshmen drawing room is a large room for the

making of blue prints. It contains the blue print machine, sliding on a frame in the window, with south exposure so that sunlight is available for the greater part of the day. A large sink for the washing of prints is provided.

CHEMICAL LABORATORIES

There are three chemical laboratories—one for general chemistry, one for qualitative analysis, and one for quantitative analysis. The last two laboratories are equipped with large individual desks with tile tops, each desk being supplied with gas from the city mains. Between the desks are sinks with flowing water. Each student receives a separate and complete set of reagent bottles and supplies. The laboratories are well lighted and provided with ample hoods to carry off the fumes. The quantitative laboratory is equipped with a separate balance room in which are analytic balances of standard makes, among them Becker's and Troemner's.

The apparatus is ample for all mineral, alloy and rock analysis, and includes combustion furnaces, apparatus for gas analysis, and facilities for electrolytic precipitations.

PHYSICAL LABORATORY

The Physical Laboratory is located in the basement of the annex of the Main Building, thus securing absolutely stable foundations for such apparatus and instruments as require it.

The laboratory is thoroughly equipped with physical apparatus, such as balances, Atwood machine, air pumps, hydrometers, specific gravity apparatus, spectroscopes, spectrometers, apparatus for measurements in light and sound, calorimeters, electrical apparatus, such as Wheatstone bridges, magnetometers, voltmeters, ammeters, wattmeters, galvanometers, electro-dynamometers, potentiometers,

electrometers, fluxmeters, wireless telegraphy and telephone, engine indicators, etc. For electrical experimentation, dynamos and motors are available.

ASSAY LABORATORY

The Assay Laboratory is modern in its appointments. It has, within the last year, been completely remodeled. It contains a room in which the students are provided with individual desks, pulp balances, for the mixing of assay charges; a balance room provided with concrete foundation piers; the pulp room in which the ore samples, etc., are crushed and sampled, and the furnace room in which furnace work is done exclusively. This furnace room contains five double muffle-furnaces, heated by soft coal.

These are placed in openings in a heavy dividing wall, separating the machinery hall from the front part of the building. In this way the front of the furnaces with the muffle openings are in the furnace room, flush with the wall, while the firing and taking out of the ashes is done on the other side of the wall, thus avoiding the dust and dirt where it is very undesirable. The furnace room is fire-proof. There is a melting furnace using coke, and gasoline furnaces made by Braun & Company, San Francisco.

The balance room is provided with Ainsworth, Fimer & Amend, Thompson, and Keller balances. In the pulp room an electric motor furnishes power for the small Gates sample crusher and a sample grinder. A Calkins automatic cupel machine is used for the making of cupels. A large number of ore samples are kept on hand. Ores from all parts of this country are provided in great variety. The nearness of a smelter and mills makes it comparatively easy to procure many types of furnace products, such as mattes, flue dust, fume, and umpire samples for close checking work.

METALLURGICAL LABORATORY

This laboratory has been completely remodeled during the past year and much additional machinery installed. It is designed to illustrate chiefly the metallurgy of gold, silver, copper and lead, and is best adapted to handle lot of ore from three to five tons, though as much as 75 tons of material have passed through the furnace units.

The crushing machinery consists of a No. O Gates breaker, a pair of 16x10 in. rigid rolls, a 6x4 in. Bosworth jaw crusher, a 10x4 ft. Alsing tube mill, a 3½ ft. Huntington mill and a 3-300 lb. stamp battery and amalgamating plates.

The cyanide plant consists of 2-5x3 ft. sand tanks. 2-5x5 ft. slime tanks; 2-4x3½ ft. solution storage tanks; 2-4x3½ ft. gold solution tanks and 2 zinc boxes. For the agitation of slimes a 10x2½ ft. Pachuca tank is used, while for slime thickening and filteration a 5 ft. Callow cone and small Moore vacuum filter are employed. The accessory apparatus for cyanidation consists of 4-1½ in. centrifugal pumps, a vacuum pump, an air compressor and receiver, and 3 electric motors for power, etc.

The concentration apparatus consists of a Traylor table, a Frue Vanner, 2 classifying cones, an impact scree, a Vezin sampler, and a Jarvis experimental jig.

The smelting machinery consists of 130 in. blast furnace which may be used for either lead or copper smelting, forehearths, slag cars, and other accessories; a small Bruckner roasting furnace, and a Green rotary blower. The crushing and cyaniding and concentrating machinery is so placed that any combination of apparatus desirable may be secured and practically every possible system of treatment worked out.

Large gas furnaces are available for experimental work, such as roasting, smelting, annealing, etc. The

metallographic laboratory is equipped with six metallographic microscopes, microphotographic apparatus, polishing machines, etc., and much pyrometer apparatus of various kinds, including potentiometer, resistance boxes, etc.

Other scientific metallurgical apparatus such as calorimeters, pyrometers, apparatus for gas analysis, are available for frequent use. A special chemical laboratory is provided in the metallurgical building for metallurgic analysis in connection with cyanidation and smelting.

MINERALOGICAL LABORATORY

This is a large room well equipped with low tables arranged for study and determination of minerals. Students are provided with the necessary reagents and apparatus by the department, upon the payment of a small fee. Each student has his own locker. A large working collection of carefully labeled minerals available for student's use is kept in specially designed cases ready of access, and a considerable collection of unknown minerals is at hand for determination.

GEOLOGICAL MUSEUM

The museum is an important feature in the equipment of the School of Mines. Its contents have been chosen to assist in the teaching of geology, mineralogy, petrography and paleontology, rather than to become a store house of curiosities. The room is thirty-six by forty-seven feet in size and lighted by ten large windows.

Two kinds of cases are used for the display of specimens—central cases and wall cases. There are eight central cases, each consisting of two parts of three compartments each, with glazed tops, and a six compartment massive base; the whole constructed in such manner as to serve practically as two sections,

fitting tightly, back to back. The display surface, under glass, is nearly fifty square feet for each case. The bases are especially designed for the storage of material not needed for constant exhibition. The cases are of oak.

The wall cases are finished in pine and have glazed doors. Each is seven feet six inches high and contains three double-door compartments of six shelves. The cases are practically adapted for the display of large specimens.

Cases one and two contain a general collection of minerals arranged according to Dana's system of classification. Cases three and four contain series of specimens to illustrate general features of mineralogy, geology and petrography. Case five contains a collection of well preserved fossils, carefully selected to show the more prominent features of paleontological interest. Case six contains representative collections of Black Hills ores and rocks. Case seven contains Cretaceous and Tertiary fossils from the Black Hills region, mainly from the Cheyenne river and the White River Bad Lands. Case eight contains a good collection of Black Hills minerals.

The wall cases are for large specimens of all classes, some of which are very beautiful. The collection from the Black Hills is especially noteworthy and is very rich in rare minerals of the region, as for instance, lepidolite. wolframite, columbite, amblygonite, etc.

The museum contains two large topographic maps of the Black Hills made for the St. Louis Exposition.

The museum has also recently been enriched by the gift of a very valuable and unique rock section of the Homestake Mine, donated by the Homestake Mining Company of Lead, South Dakota.

The collection of minerals exhibited by the School at the St. Louis Exposition, 1904, received a diploma and gold medal.

MINING AND METALLURGICAL MUSEUM.

This is situated on the second floor of the Metallurgical Building, in a large, well lighted room and contains wall cases for the display of specimens. It has a fair collection of furnace products, such as slags, mattes, etc., wall boards of hoisting ropes and screens, and similar materials. In time it will become a valuable adjunct to the teaching of mining and metallurgical subjects. It is constantly being added to by the kindness of the manufacturers and mining companies, who donate exhibits. The School is always very grateful for donations of this kind and makes due acknowledgment for the same.

SHOPS

In the basement of the Main Building a large workshop is provided, containing a machine lathe, planers, drill press, other machinery and many tools. Occasion often arises for the design and construction of certain pieces of apparatus for different departments, especially those of Metallurgy, Mining, Physics and Chemistry.

Many pieces of apparatus have been constructed in this shop which would have cost the School considerable sums of money. The students of the upper classes are granted permission to use the facilities offered by the shop, whenever occasion arises to do so, in their work.

PUBLICATIONS

Bulletin No. 1.—Preliminary Report of the Dakota School of Mines upon the Geology, Mineral Resources and Mills of the Black Hills of Dakota; 171 pages. 1888 (Out of print.)

By F. R. Carpenter and H. O. Hofman.

Bulletin No. 2.—Notes on the Geology and Mineral

Deposits of a Portion of the Southern Black Hills; 41 pages, Department of Geology. 1899.

By C. C. O'Harra and A. Forsyth.

Bulletin No. 3.—Cyanide Experiments on the Silicious Ores of the Northern Black Hills, etc.; 27 pages; Department of Metallurgy. 1900.

By A. Forsyth and G. H. Clevenger.

Bulletin No. 4.—History of the Early Explorations, etc., in the Black Hills, and Bibliography of Contributions to the Geology of the Black Hills Region; 88 pages; Department of Geology. 1900. (Out of print.)

By C. C. O'Harra.

Bulletin No. 5.—The Cyanide Process in the Black Hills of South Dakota; 88 pages; Department of Metallurgy. 1902.

By C. H. Fulton.

Bulletin No. 6.—The Mineral Wealth of the Black Hills; 88 pages; Department of Geology. 1902. Hills; 88 pages; Department of Geology. 1902. (Out of print.)

By C. C. O'Harra.

Bulletin No. 7.—Metallurgical Practice in the Black Hills of South Dakota; 63 pages; Department of Metallurgy. 1904.

By C. H. Fulton.

Bulletin No. 8.—The Cement Resources of the Black Hills.

Bulletin No. 9.—Annual Catalog; Descriptive of the Courses Given by the School, and Containing General Information.

Bulletin No. 10.—Announcements containing information about the School, issued regularly.

The publications of the School may be had, free of charge, by addressing the President.

STUDENTS' EXPENSES

TUITION

The tuition and incidental fee is $6 per semester or $12 per year, payable in advance on registration. This fee is the same to residents and non-residents of the state.

According to Section 209 of the Political Code, 1903, page 40:

"The regents shall fix all rates of tuition and other fees, to be paid by students, but such rates shall be the same in all the different institutions. They may receive, in any one of the institutions under their control, free of tuition, two students, appointed by each State Senator, and one by each Representative of the State Legislature, which appointees shall be residents of their respective districts or counties, and whose term shall expire with the term of office of said Senator or Representative, provided that such appointees shall comply with all the rules and requirements of the institution which they desire to enter. No student, however, shall receive any other gratuity whatever."

FEES

Fees enumerated below cover the bare cost of materials and supplies consumed in the laboratories and loss due to breakage, etc.

All fees are payable at the beginning of each semester, on registration. (Consult Departments of Instruction for description of courses.)

Chemistry 1-2, Elementary Chemistry, per semester	$ 4.00
Chemistry 11-12, Qualitative Analysis, per semester	7.00
Chemistry 17-18, Quantitative Analysis, per semester	8.00

Chemistry 21-22, Metallurgical Analysis, per semester	8.00
Metallurgy 24, Assaying, per semester	25.00
Metallurgy 19-21-22, Metallurgical Laboratory, per semester	5.00
Metallurgy 11, Metallography	5.00
Mineralogy 1, General Mineralogy, per semester	5.00
Mineralogy 2, Blow-pipe Analysis, per semester	5.00
Geology 3-4, Petrography, per semester	2.00
Physics 3-4, Elementary Physics, per semester	1.00
Physics 7-8, Advanced Physics, per semester	2.00
Engineering 6, Surveying, per semester	3.00
Engineering 1-2, Mechanical Drawing, per year	1.00
Engineering 3-4, Mechanical Drawing, per year	1.00
	1.00
Preparatory Science, per semester	2.00
Chemistry, all courses, deposits to cover breakage, etc.	5.00
Metallurgy, all courses, deposits to cover breakage	5.00
Fee for bachelor's degree	5.00
Fee for advanced degree	10.00
Athletic Association Fee, per year	5.00

(Note—No platinum is furnished by the Department of Chemistry.)

Other Expenses of the Nature of Fees

The Department of Engineering furnishes supplies for the mechanical drawing courses, practically at cost.

Engineering 1-2, Mechanical Drawing, will cost approximately, $7.00 for the year, exclusive of drawing instruments, which the student purchases on his own account, prices ranging from $13.00 up for a good set of instruments.

Engineering 3-4, Mechanical Drawing, will cost approximately $4.00 for the year.

Engineering 7-9, Machine Design, will cost $3.00 for the year.

Fee for permit for "Conditional" Examinations, $2.00.

LIVING EXPENSES

Board and room may be obtained in town with private families or in boarding houses or hotels, at rates varing from $20 to $30 per month, according to accommodations; $25 per month is a fair average and will insure good board and room. Rooms only may be obtained for from $5 to $10 per month, and table board for from $4 upwards, per week. This makes the expense for board and room for the school year of 37 weeks range from $185 to $275, according to location and accommodations.

Expense of laundry and incidentals vary with the individual. The average for laundry expense is about $20 for the school year.

Cost of Text Books

Freshmen year	$13.00
Sophomore year	17.00
Junior year	23.00
Senior year	19.00

Total cost, including living, fees, books, incidental expenses, etc.

Freshman year	$280 to $380
Sophomore year	275 to 370
Junior year	320 to 430
Senior year	290 to 385

This estimate does not include expenses incurred outside of school. A certain sum for this purpose should be added according to individual taste.

INCIDENTAL EXPENSES

Students are required, at various times, to take

part in the geological, mining and metallurgical trips undertaken into the Black Hills mining district. The geological trip of the Freshmen year usually costs the student about $10. Trips in the Junior and Senior year, for mining and metallurgical exploration, cost a similar sum; so that the student should figure on a cost of from $30 to $40 at least, for expenses of this kind during his four years' course at the school.

OPPORTUNITY FOR SELF HELP

Opportunity for self help in towns of the size of Rapid City is necessarily limited. It is also to be borne in mind that the course of study is an arduous one and requires the student's best efforts, and if conscientiously and satisfactorily performed, will leave comparatively little outside time in which to earn funds.

Some students find employment which nets them their board and lodging by doing chores in private families or assisting in some of the stores. Some find employment in the boarding houses. The School is able to assist Junior and Senior students, to some extent, by employing them in the capacity of assistant janitors and similar work.

Students who have become acquainted, by a residence in town for a year or two, find it easier to obtain help than strangers. For this reason it is essential that a student who comes as a stranger to enter the School should be provided with sufficient funds to carry him through the first year, at the very least.

STUDENTS' ORGANIZATIONS AND ATHLETICS

The student organizations are the Students' Association and the Athletic Association. The Students' Association has for its aim the general welfare of the

student body. The Athletic Association has for its aim the furtherance of legitimate athletics, and maintains football, baseball and basket ball teams, and track athletics. Membership in this association is obligatory, all students paying the annual fee of $5.00. It is governed by a Board of Control made up of three members of the faculty, three students selected from the Sophomore, Junior, and Senior classes respectively, and one Alumni member. The Association maintains baseball, football, and tennis grounds. The school heartily encourages athletics within the proper limits.

The Triangle Club is a students' literary association.

Y. M. C. A.

There is a flourishing Y. M. C. A. in the city, of which many of the faculty and students of the School are members. This organization maintains a very complete reading room and well equipped baths for the use of the members. There is also a gymnasium which supplements the athletics of the School of Mines.

CONDUCT

The School has no codified rules of conduct. Students are held to a strict account of their work and are expected to fulfill their inheritance as gentlemen. Failure to live up to the requirements is considered a sufficient cause for severing their connection with the School.

DETERMINATION OF MINERALS AND ASSAYING

Minerals are determined free of charge. Samples for determination should be addressed to the Depart-

ment of Geology, State School of Mines, Rapid City. Assays for gold and silver, etc., and chemical analysis, both quantitative and qualitative, are made at reasonable rate. Prices will be sent upon application to the Department of Metallurgy. All samples for analysis and assay should be addressed to this department.

REQUIREMENTS FOR ADMISSION

Freshmen Class

Requirements for admission to the Freshman class of the Mining Engineering course are as follows:

Fourteen units are necessary for entrance.

Required Units

Arithmetic	1 unit
Algebra	1.5 units
Plane Geometry	1 unit
Solid Geometry	0.5 unit
English	2 units
History	1 unit
Physics	1 unit
Chemistry	1 unit
Total required units	9

Elective Units

German	1, 2 or 3 units
French	1, 2 or 3 units
Latin	2, 3 or 4 units
Greek	1 unit
Spanish	1 or 2 units
English	1 or 2 units
History	1 or 2 units
Mathematics	0.5 unit
Science	1 or 2 units
Drawing	1 unit
Shop Work	1 unit
Civil Government	0.5 unit

Bookkeeping	1	unit
Elective units required for entrance	5	

A unit course of study is defined as a course covering a school year of not less than 35 weeks with 5 periods of at least 45 minutes each per week.

Method of Entering the School

First: By Certificate. Graduates of accredited High Schools in the State of South Dakota and other states will be provisionally admitted without examination, if they present proper credentials, certifying to the fact that they have completed the studies mentioned under the requirements for admission.

Second: By examination. All other candidates for admission to the regular mining engineering course will be required to pass entrance examinations in the subjects specified. These examinations are held at Rapid City, on dates mentioned in the calendar. Students who are deficient in subjects required for entrance into the regular mining engineeering course are permitted to enter the Preparatory Department, maintained by the School for the special purpose of preparing students so deficient.

Credentials for entrance should be in the hands of the President on or before the date set in the calendar for the examination of credentials by the committee on admission.

Application for admission blanks will be sent upon request.

Description of Units Required for Entrance

Required Units

Mathematics—The four and one-half units which may be offered in mathematics are as follows:

Arithmetic—One unit, complete, including the metric system.

Algebra—One and one-half units. The equivalent

ot A, B and C algebra described under Preparatory Mathematics in the Preparatory Catalog.

Plane Geometry—One unit. The equivalent of plane geometry described under Preparatory Mathematics.

Solid Geometry—One-half unit. The equivalent of solid geometry described under Preparatory Mathematics.

English—Two units. The equivalent of English 1-2 and 3-4 described under Preparatory English and other courses described in that department.

Physics—One unit. The equivalent of physics described under Preparatory Physics in the Preparatory Catalog.

Chemistry—One unit. The equivalent of elementary chemistry described in the Preparatory Catalog.

History—One unit. The History of the United States, English or Ancient History, as described under History, in the Preparatory Catalog.

Elective Units

The equivalent of courses, not mentioned above, described under Mathematics (trigonometry only). Languages, History, English and Preparatory Science, in the Preparatory Catalog.

Special Students

Applicants for admission, who are graduates of colleges or technical schools will be admitted as special students and permitted to take any subject they desire, taught in connection with the regular courses. Persons of mature age, who have been employed in mines and metallurgical plants and who desire to take up special courses, particularly along the lines of mining, metallurgy and geology, will be admitted as special students, provided they show that they have sufficient foundation to take up the work with profit to themselves. No immature person will be permitted to enter the School to take advanced courses, such as Assaying, Metallurgy, etc.

Admission to Advanced Standing

Graduates of colleges and technical schools who enter the School as candidates for a degree will receive proper credit for all such studies which they have completed and which form part of the curriculum of the School of Mines. The faculty decides these cases upon the basis of individual merit.

Degrees

The School of Mines offers two degrees: That of Bachelor of Science in Mining Engineering, to the candidate who has successfully completed the regular Mining Engineering course, and that of Bachelor of Sciencee in Metallurgical Engineering, to the candidate who has completed successfully the metallurgical option of the Mining Engineering course.

The degree of Engineer of Mines, or of Metallurgical Engineer, will be conferred upon graduates of the Engineering course of the School, who shall have devoted one year to graduate study in the School of Mines, under the direction of the faculty, passing required examinations upon the studies pursued, or to those who shall furnish suitable evidence of two years' successful experience in mining or metallurgical work, and who shall submit an adequate thesis which shall be duly considered and accepted by the faculty before such advanced degree will be granted.

Students who complete the studies in the Preparatory Department wil receive, therefor, the usual diploma.

Thesis

Every candidate for a degree in the regular Mining Engineering course or in the Metallurgical option of that course is required to present a thesis on some subject patent to his course before he will receive his degree. The thesis will be assigned to the individual members of the Senior class by a special thesis com-

mittee of the faculty. The standard form of thesis shall be the working out of plans for the development of the hypothetical mine, such subject to be assigned to all students except that the thesis committee may vary the subject as its judgment dictates. Report of progress in thesis work must be made at stated intervals to the thesis committee. Theses must be submitted to the faculty not later than May 15th, and must be typewritten on paper 8½x11 inches in size. Two copies must be furnished; one for the department within which the thesis falls, and one for the Library. No degrees will be granted unless the conditions concerning theses are fully satisfied.

Summer School

Beginning with the close of the school year 1909-10, a summer school will be inaugurated, to be held in the Black Hills. It will begin immediately after commencement. Two weeks will be devoted by the Junior class to surveying in the field, and one week by the Senior class to visits to mines and metallurgical works.

Courses and Departments

The courses given by the School of Mines are:
First—Mining Engineering Course.....4 years
Second—Mining Engineering Course, Metallurgical Option .....4 years

SYNOPSIS OF COURSES

Mining Engineering Course

First Year

First Semester—	L.	Lab.
Mathematics 7—Trigonometry	80	
Chemistry 5—General chemistry.....	48	
Chemistry 9, 11—Qualitative analysis..	32	144
Geology 1—General geology.....	64	48

Engineering 1—Mechanical drawing...		96
English 9—Composition	64	
	288	288
Hours per week....	18	18
Second Semester—		
Mathematics 8—Analytic geometry....	80	
Chemistry 6, 8—General chemistry.....	48	48
Chemistry 10, 12—Qualitative analysis..	16	96
Geology 2—General geology.....	64	48
Engineering 2—Mechanical drawing...		96
English 10—Composition	64	
	272	288
Hours per week....	17	18

Second Year

First Semester—		
Mathematics 9—Calculus	80	
Chemistry 13—Industrial chemistry....	32	
Chemistry 15, 17—Quantitative analysis	32	144
Mineralogy 1—General mineralogy.....	48	48
Engineering 3—Descriptive geometry...		96
Engineering 5—Surveying	48	48
	240	336
Hours per week....	15	21
Second Semester—		
Mathematics 10—Calculus	80	
Chemistry 14—Industrial chemistry....	32	
Chemistry 16, 18—Quantitative analysis	32	144
Mineralogy 2—Blow pipe analysis.....	16	96
Engineering 4—Descriptive geometry..		48
Engineering 6—Surveying	24	48
Metallurgy 2—General metallurgy.....	48	
Mining 2, 4—Mine surveying.....24		Summer
	256	336
Hours per week....	16	21

Third Year

First Semester—		
Physics 5, 7—General physics	64	48
Physics 9—Analytic mechanics	48	
Geology 3—Physical geology	48	48
Engineering 7—Topographical drawing		24
Engineering 9—Machine design		96
Engineering 11—Graphics	8	24
Mining 1, 3—Ore dressing	64	48
Mining 5—Boring, breaking ground, explosives	48	
	280	288
Hours per week	17½	18
Second Semester—		
Physics 6, 8—General physics	64	96
Engineering 14—Mechanics of materials	64	
Geology 4—Petrography	48	48
English 12—Economics	48	
Metallurgy 24—Assaying	32	144
Engineering 12—Graphics	16	48
Mining 6—Tunneling, transportation, supporting excavations	48	
	320	336
Hours per week	20	21

Fourth Year

First Semester—		
Engineering 15—Electrical engineering	64	48
Geology 5—Economic geology	64	
Mining 7—Drainage, hygienic conditions	32	
Mining 9—Shaft sinking, exploitation	48	
Metallurgy 5—Gold and silver	48	
Metallurgy 7—Iron and steel	32	
Mining 11—Mine design		96
Mining 13—Mine accounting		32
Metallurgy 19—Laboratory		48

Thesis		48
	288	272
Hours per week	18	17
Second Semester—		
Engineering 16—Hydraulics	32	24
Engineering 18—Thermodynamics	32	24
Geology 6—Economic geology	64	
Mining 8—Mine examination, administration	32	
Mining 10—Hoisting, ventilation and lighting, placer mining	48	
Metallurgy 8—Copper and lead	32	
Engineering 20—Power plants	32	
Mining 12—Mine designing		96
Mining 14—Mining law	16	
Metallurgy 20—Mill run		48
Thesis		96
	288	288
Hours per week	18	18

Metallurgical Engineering Course

First Year

First Semester—	L.	Lab.
Mathematics 7—Trigonometry	80	
Chemistry 5—General chemistry	48	
Chemistry 9, 11—Qualitative analysis	32	144
Geology 1—General geology	64	48
Engineering 1—Mechanical drawing		96
English 9—Composition	64	
	288	288
Hours per week	18	18
Second Semester—		
Mathematics 8—Analytic geometry	80	
Chemistry 6, 8—General chemistry	48	48
Chemistry 10, 12—Qualitative chemistry	16	96
Geology 2—General geology	64	48

Engineering 2—Mechanical drawing...		96
English 10—Composition	64	
	272	288
Hours per week....	17	18

Second Year

First Semester—		
Mathematics 9—Calculus	80	
Chemistry 13—Industrial chemistry....	32	
Chemistry 15, 17—Quantitative chemistry	32	144
Mineralogy 1—General mineralogy....	48	48
Engineering 3—Descriptive geometry...		96
Engineering 5—Surveying	48	48
	240	336
Hours per week....	15	21
Second Semester—		
Mathematics 10—Calculus	80	
Chemical 14—Industrial chemistry.....	32	
Chemistry 16, 18—Quantitative analysis	32	144
Mineralogy 2—Blow pipe analysis.....	16	96
Engineering 4—Mechanical drawing...		48
Engineering 6—Surveying	24	48
Mining 2, 4—Mine surveying.....	24	Summer
Metallurgy 4—General metallurgy.....	80	
	288	336
Hours per week....	18	21

Third Year

First Semester—		
Physics 5, 7—General physics.....	64	48
Physics 9—Analytic mechanics.....	48	
Chemistry 19, 21—Quantitative analysis	48	96
Engineering 7—Topographical drawing		24
Engineering 9—Machine designing.....		96
Engineering 11—Graphics	8	24

Mining 1, 3—Ore dressing	64	48
Mining 5—Boring, breaking ground, explosives	48	
	280	336
Hours per week	18	21
Second Semester—		
Physics 6, 8—General physics	64	96
Engineering 14—Mechanics of materials	64	
Chemistry 20, 21—Quantitative analysis	16	32
English 12—Economics	48	
Metallurgy 24—Assaying	32	144
Engineering 12—Graphics	16	48
Mining 6—Tunneling, transportation, supporting excavations	48	
	288	320
Hours per week	18	20

Fourth Year

First Semester—		
Engineering 15—Electrical engineering	64	48
Metallurgy 5—Gold and silver	48	
Metallurgy 7—Iron and steel	32	
Metallurgy 11—Metallography	16	48
Metallurgy 13—Electrometallurgy	32	
Metallurgy 15—Zinc and minor metals	32	
Metallurgy 17—Metallurgical design		96
Metallurgy 21—Metallurgical laboratory		96
Mining 13—Mine accounting	32	
Mining 7—Drainage, hygenic conditions	32	
Thesis		48
	288	336
Hours per week	18	21
Second Semester—		
Engineering 16—Hydraulics	32	24
Engineering 18—Thermodynamics	32	24

Engineering 20—Mech. Eng. of power plants	32	
Metallurgy 6—Gold and silver	48	
Metallurgy 10—Copper and lead	80	
Mining 14—Mining law	16	
Metallurgy 18—Metallurgical design		96
Metallurgy 20—Mill run		48
Metallurgy 22—Metallurgical laboratory		48
Mining 8—Mine examination, administration	32	
Thesis		96
	272	336
Hours per week	17	21

Departments of Instruction

Department of Metallurgy

Professor Fulton Mr. German
Mr. Stoner

Metallurgical subjects are taught by lecture courses with frequent reference to standard works on the subject, and to the current literature.

The lectures are supplemented, as far as possible, by laboratory work and experiments, and by excursions to neighboring metallurgical works. The School is favorably situated, in being contiguous to an active gold mining district, the Black Hills, affording excellent opportunity to study the practical side of metallurgy, particularly that of gold, on a large scale and at close range. The stamp mills and cyanide plants of Lawrence county are easily reached by rail in two hours' time.

A well equipped metallurgical laboratory is available for use, as it is desirable that the students should be thoroughly trained in the basic scientific principles of metallurgy. With actual metallurgical operations, on a large scale, the students become familiar to such

an extent as is desirable durng his school years, by visits to the working plants of the district.

In the laboratory he becomes acquainted with the use of pyrometers, calorimeters, microscopes for the examination of metals and furnace products, and other scientific metallurgical apparatus. He conducts experiments in the refining and heat treatment of steel, electric deposition of metals, formation of slags, refining of metals, cyanide process and amalgamation, etc. He becomes experienced to some extent with the actual working of a furnace, stamp mill, concentrating tables and cyanide plant with which the laboratory is provided.

The department is equipped with a card index of metallurgical literature, which covers all of the subjects of interest completely, and is at the service of students.

Metallurgy 2. MR. GERMAN.

Introductory Metallurgy: This course consists of lectures on the physical properties of metals; on alloys, their types, nature and properties; fuels; combustion; refractory materials, thermal measurements; discussion of metallurgical principles; slags and furnace products, and their nature; types of furnaces and furnace construction; the means of supplyng and heating blast; thermo-chemistry, including a discussion of chemistry at high temperatures; typical metallurgical processes, and the general economic considerations of metallurgy, such as buying and selling ores and metallurgical products. Students are requested to do outside reading from references given in the class room, and hand in for examination, papers on topics assigned. Laboratory work covering part of this course is carried out in the Senior year, and is described under Metallurgy 19.

Sophomore Year, Mining Engineering option, Second Semester: Three lecture hours per week.

Text Book: Fulton, Principles of Metallurgy.

Metallurgy 4. MR. GERMAN

Introductory Metallurgy. Same course as Metallurgy 2, but amplified by detail.

Sophomore Year: Metallurgical option, Second Semester: Five hours per week.

Text Book: Fulton, Principles of Metallurgy.

Metallurgy 5. PROFESSOR FULTON.

The Metallurgy of Gold and Silver: This course consists of lectures on the metallurgy of gold-silver, taking up, first, modern stamp mill practice; discussing in detail, mortar boxes, stamps, screens, general battery construction, etc., and the influence of weight of stamp, screen mesh, mortar box dimensions, amount of water, on results obtained. Inside and outside amalgamation is taken up in detail; the general mill arangements; clean up; the influence of other processes following amalgamation is discussed. Modern fine grinding in tube mills and other apparatus is taken up. This is followed by a discussion of the cyanide process for gold and silver ores; wet and dry crushing; crushing in cyanide solution; the separation of sands from slimes; the treatment of sands by percolation; the treatment of slimes by decantation, filter pressing and vacuum filtration; the precipitation of gold and silver by the various methods in use, methods of cleaning up and the smelting of cyanide precipitates. The general chemistry of cyanidation and the proper performance of laboratory experiments is discussed. The chloridizing roasting of silver ores; pan amalgamation; leaching process for silver ores, etc., concludes the course.

Senior Year, Both options: First semester, three hours per week.

Text book Austin, Metallurgy of the Common Metals. Reference works: Julian & Smart, Cyaniding of Gold and Silver Ores; Henry Louis, Handbook of Gold Miling; T. K. Rose, Metallurgy of Gold.

Metallurgy 6. PROFESSOR FULTON.

The Metallurgy of Gold and Silver: This course comprises lectures on the cyanidation of silver ores; the melting and refining of gold and silver bullion; the parting of gold from silver; detailed discussion of the roasting of gold and silver ores, preliminary to extraction processes; the chlorination process; details of gold milling processes not taken up in course 5

Senior Year, Metallurgical option: Second Semester, three hours per week.

Text book, Julian & Smart, Cyanidation of Gold and Silver Ores.

Metallurgy 7. MR. GERMAN.

Iron and Steel. This course consists of lectures on iron alloys, their classification, structure, properties, metallography; taking up more particularly iron and steel. The hardening and tempering of steel is taken up in detail. The metallurgy of cast iron, wrought iron and steel is discussed in principle, but not in great detail. Especial attention is paid to the principles and chemistry of the iron blast furnace and to the Acid Bessemer process, and to the Acid and Basic Open Hearth processes. Statistics of the iron and steel industry are given. The student is required to do considerable outside reading.

Senior Year, Both options: First Semester, two hours per week.

Text Book: H. H. Campbell, The Manufacture and Properties of Iron and Steel.

Metallurgy 8. MR. GERMAN.

The Metallurgy of Copper and Lead. This course consists of lectures on the modern metallurgy of copper and lead. It discusses the types of copper and lead ores and the methods suitable for the treatment of the different types. The principles of the reverberatory process for copper are discussed in de-

tail, as it brings out clearly the chemistry of copper. Matte smelting for copper ores is discussed, both pyrite smelting and ordinary matte smelting being taken up in detail; also the roasting of copper ores. This is followed by the discussion of the Bessemerizing of copper mattes and the electrolytic refining of blister copper. Wet methods for copper ores are discussed. This is followed by a discussion of the blast furnace smelting of lead ores, including the roasting of ores, composition of lead slags, the products of the furnace, etc. The practice of large centrally located plants, treating both mixed lead and copper ores is taken up; also the reverberatory smelting of lead ores, the desilverization of lead bullion, and the refining of lead.

Senior Year: Mining option. Second Semester, two hours per week.

Text book, Austin, Metallurgy of the Common Metals. Reference works: Hofman, Metallurgy of Lead. Peters, Modern Methods of Copper Smelting; Iles Lead Smelting; Schnables, Handbook of Metallurgy; Peters, Principles of Copper Smelting.

Metallurgy 10. PROFESSOR FULTON.

The Metallurgy of Copper and Lead. The same as Metallurgy 8, except that it is amplified by detail.

Senior Year, Metallurgical Option: Second Semester, five hours per week.

Metallurgy 11. PROFESSOR FULTON.

Metallography. The study of metals and alloys by the microscope. The preparation of microsections. Thermal analysis. The study of iron, steel, brasses, bronzes, bearing metals, etc. Micro-photography.

Senior Year, Metallurgical option: First Semester, one hour per week lectures, three hours per week laboratory work.

Text Book: Goerens, Metallography.

Metallurgy 13. PROFESSOR FULTON.

Electro-metallurgy. Electrolytic processes. Theory. Electrolytic processes for copper, gold, silver, lead, nickel and tin.

Electrothermic processes. Theory. The electric furnace for iron and steel, ferro alloys, carbides, aluminum, zinc and for miscellaneous purposes.

Senior Year, Metallurgical Option: First Semester, two hours per week.

No text book required. Reference works: Stansfield, The Electric Furnace, Borchers, Electric Smelting and Refining.

Metallurgy 15. MR. GERMAN.

The Metallurgy of Zinc, and the Minor Metals. The roasting of zinc ores; zinc distillation furnaces; the distillation process, the purfication of spelter; commercial considerations. The metallurgy of nickel antimony, tin, bismuth, tungsten and arsenic.

Senior Year, Metallurgical option: First Semester, two hours per week.

No text book required. Reference work: Ingalls, The Metallurgy of Zinc and Cadmium.

Metallurgy 17-18.

PROFESSOR FULTON AND MR. GERMAN.

Metallurgical Design. The design of furnaces, flues, chimneys, dust chambers, etc; mill apparatus, such as classifying cones, elevators, tanks, amalgamating tables, etc; the design of mill and smelter buildings.

Senior Year, Metallurgical Option: Six laboratory hours per week throughout the year.

Metallurgy 19. MR. GERMAN.

Metallurgical Laboratory: Laboratory practice in pyrometry; the calibration of the thermo couple; the roasting of ores, noting the formation of sulphates, etc.; the desilverization of lead bullion by means of

zinc; the electrolytic deposition of copper and lead; the roasting of gold and silver ores; experiments with the cyanide process, including the titration of pure and mill solutions with silver nitrate, analysis of cyanide solutions, cyanide experiments with small lots of ore in the laboratory to determine extraction, etc.

Senior Year, Mining Engineering Option: First Semester, three laboratory hours per week.

Text Book: Clennell, Chemistry of Cyanide Solutions, and Howe, Laboratory Note Book.

Metallurgy 20.

Metallurgical Laboratory. One unbroken week spent in the metallurgical laboratory on work assigned by the department.

Senior Year, Both Options: Second Semester, forty-eight hours.

Metallurgy 21-22.

Professor Fulton and Mr. German.

Metallurgical Laboratory. Course similar to Metallurgy 19, but amplified.

Senior Year, Metallurgical Option. Six laboratory hours per week throughout the year.

Metallurgy 24. Mr. German.

Assaying: This course is taught by lectures and by laboratory work, based on the lectures. Elementary chemistry, qualitative and quantitative analysis are pre-requisites, being necessary for a thorough understanding of the work.

The work of the laboratory includes assaying of reagents; the testing of ores to discover their nature; the study of oxidizing and reducing reactions occurring in assaying; the study of typical assay slags; the assaying of pure gold and silver ores by crucible and scorification methods; the special assaying of copper and zinc ores containing gold and silver; the assaying of arsenical and antimonial ores for gold and silver;

the study of cupellation and the factors which influence its results; the assaying of impure ores by the roasting, the nitre, and the excess litharge methods; the assaying of telluride ores, lead bullion, and cyanide precipitates for gold and silver; the assaying of gold and silver bullion; the assaying of ores and alloys for platinum, iridium, etc.. the assaying of lead, tin, bismuth, and antimony ores for their respective base metals; the dry assay of mercury ores for mercury, and concentration and free milling tests on a laboratory scale.

Junior Year, Both Options: Second Semester. Two lecture periods and nine laboratory hours per week.

Text Book: Fulton, Manual of Fire Assaying.

Department of Geology and Mineralogy

PROFESSOR O'HARRA MR. JEFFRIES

Library, Laboratory and Field Facilities.

A good, well equipped departmental library is placed convenient to the lecture and laboratory rooms and students are required to make intelligent use of the literature contained therein.

The laboratory equipment and the museum collections, elsewhere described, furnish indispensable material for practical work of many kinds.

Field facilities are unsurpassed. Unusual opportunity is afforded for study in the field of the various geological horizons, including important and valuable economic deposits. Wthin a few miles of the School the student may observe upturned strata of nearly all geological ages. Twenty miles southwest of Rapid City is the Harney Peak granite area, with its lavish variety of mineral specimens. Surrounding this is a wonderful exposure of Algonkian metamorphic rocks cut in many places by auriferous quartz veins. The Cambrian, Carboniferous, Triassic, Jurassic, and

Cretaceous are extensively developed. The famous White River Bad-lands of Tertiary age lie to the southeast of the Hills and afford fossils which have made the region known wherever the science of Paleontology is taught. In the northern part of the Hills important igneous rocks, such as rhyolite, phonolite, andesite, dacite, etc., occur in the form of dikes, sheets and laccoliths. Closely associated with these in slates, quartzites, and limestones, gold ores of the greatest importance are found.

In the autumn, short field excursions are made by the class to near-by points of interest and occasionally a visit of several days is made to more distant localities. Thus the student, in addition to lecture and laboratory instruction, has the advantage of systematically directed field study and with the information thus gained, he should be able to undertake for himself the working out of practical field problems.

Geology 1-2.

General Geology: This course is arranged primarily as introductory to all work in geology and mineralogy. It extends throughout the Freshman year and embraces a comprehensive study of the fundamental principles of geology. The course includes brief, but careful study of dynamical, stratigraphical, structural, chemical, and historical geology, and is conducted by means of lectures, text books, and laboratory work, and frequent excursions to points of particular interest. Under dynamic geology, the atmospheric, aqueous, igneous, and organic agencies are discussed with reference to their bearing on the present and past condition of the earth's surface. Stratigraphical and structural geology consider the conditions of deposition of sediments and of the disturbance of rock masses. A portion of the time allotted to these subjects is devoted to the study of such minerals and rocks as enter most largely into the structure of the earth's surface; also to the methods of geological surveying, including mapping, section making, special

problems. Chemical geology includes the study of the general relation which chemistry bears to geological phenomena, such as the formation, metamorphism, and degeneration of rocks, and the origin and alterations of the various kinds of mineral deposits. Under historical geology, the physical history of the earth is discussed, the classification and distribution of sedimentary rocks studied, and the methods of correlation explained. The course aims to equip the student with useful information concerning the phenomena and history of the earth, so that he may know the methods used in geological research, and will better understand how to interpret facts gained in the study of economic deposits.

Freshman Year: Four lecture periods and three laboratory hours per week throughout the year.

Text Book: Chamberlain and Salisbury's College Geology.

Mineralogy 1.

General Mineralogy: This course is planned to develop such information as may be needed for quick and accurate determination of mineral species in the field. The course is based on lectures, text book and laboratory work and embraces frequent rigid quizzes on features of chief importance. The physical properties of mineral are dealt with in the early part of the course; a brief study of Crystallography introducing this part of the subject. This is followed by a careful physical study of the chief economic and rock-making minerals in systematic order. Good collections, containing most of the common species of minerals and many of the rare ones, are arranged for convenient use in the laboratory and museum. Thoroughly accurate observation of labeled specimens from many localities is insisted upon, and every attention is given to simple, practical methods in the determination of unknown materials.

Sophomore Year, First Semester: Three lecture periods and three laboratory hours each week.

Text Book: Moses and Parson's Mineralogy, Crystallography, and Blowpipe Analysis.

Mineralogy 2.

Blowpipe Analysis: This course is closely associated with Course 1 and continues the same object in view, i. e., the teaching of quick methods of mineral determination. It is chiefly a laboratory study, occupying one lecture period and six laboratory hours throughout the second semester of the Sophomore year. Approximately the first third of the semester is devoted to the study of blowpipe methods, known minerals being chiefly used. After this, the student is given only unlabeled specimens, the nature and name of which he is required to learn, keeping for reference a detailed record of all results obtained during the process of determination. It is expected that, upon completing this and the preceding course, the student will have gained a fair working knowledge of approximately two hundred of the common minerals, including the chief features of their distribution, uses, value and output.

Sophomore Year, Second Semester: One lecture period and six laboratory hours per week.

Text Book: Brush - Penfield's Determinative Mineralogy and Blowpipe Analysis.

Geology 3.

Physical Geology, including Metamorphism. The purpose in this course is to bring out in some detail certain important features, too briefly considered in General Geology, that have close connection with the subject of Petrography and Economic Geology which follow. Processes of disintegration, denudation, and deposition, crustal disturbance, and metamorphic influences receive attention, particularly with reference to their immediate or ultimate relation to ore formation. The physical action of underground water commands careful study, and where physical phenomena are closely connected with chemical activity, the

chemical processes in the influencing of mineral reorganization receive proper consideration. In this, as well as in all other courses described, features of economic importance will receive particular attention, but it should be understood by the student, that the full aim of the course is to afford opportunity for as thorough and comprehensive a grasp of the subjects in hand as the time devoted to them will allow.

Junior Year, First Semester: Three lecture periods and three laboratory hours per week.

Text Book: Lecture notes.

Geology 4.

Petrography: This course is intended especially for mining students who need some training in rock determination, but who have opportunity to devote only a brief time to the subject. It embraces the macroscopic and microscopic study of specimens and is conducted by means of lectures, text books, and laboratory work. The lectures are devoted to the discussion of petrographical methods, the nomenclature of rock species, the principles of rock classification and the origin, distribution, modes of occurrence, alterations and relations of rock masses. The laboratory work embraces the study of hand specimens of rocks, the making of thin rock sections and the examination of such sections by means of the petrographical microscope. Little more than a short summary is given of the refined methods of microscopic analysis, most of the time being devoted to the simpler field methods of determining and classifying the commoner rock types. Two good Zeiss petrographical microscopes, together with necessary accessories, are available for use. There is also a Krantz collection of 350 rock types in hand specimens and in thin sections, and a fairly complete series of Black Hills rocks, a number of which have been thin sectioned for study.

Junior Year, Second Semester: Three lecture periods and three laboratory hours per week.

Text Book: Kemp's Handbook of Rocks.

Geology 5-6.

Economic Geology: This course runs throughout the Senior year and includes study of the origin, modes of occurrence and uses of economic mineral products. Beginning with this year, about one-half of the first semester will be given to the study of non-metallic products. This will include the origin, nature, relations and values of coal, petroleum, natural gas, salines, building stone, clays, cement, materials, fertilizers, abrasives, gems, etc. The rest of this course will be devoted to the study of metalic products, such as gold, silver, copper, iron, lead, zinc, platinum, mercury, nickel, etc. In this muct attention is given to the study of the principles of ore deposition and to the historical development of the theories connected therewith. Careful attention is given to the chief types of deposits and particularly to localities noted for their wealth of output.

Maps, specimens, and original papers are freely used. Attention is given to the history of mineral development, of the life and comparative importance of various regions and of the influence which economic deposits have exerted upon the regions or countries in which such deposits have been found.

The necessity of individual examination by the student of the best up-to-date literature is insisted upon, and a reasonable ability to properly use such literature is required. Much attention is devoted to the study of the many economic interests of the Black Hills region and observation of the deposits in the field is encouraged.

Senior Year: Four lecture periods per week throughout the year.

Reference Texts: Beck-Weed's Nature of Ore Deposits; Ries' Economic Geology of the United States; Kemp's Ore Deposits of the United States and Canada.

Department of Mining

PROFESSOR EHLE.

The instruction in mining is given by lecture courses, illustrated by lantern views, photographed and drawn; by frequent reference to standard works and current literature; by experimental work on various types of ores, carried on in the mining laboratory, and by excursions to near by mines and mills for the purpose of observing and noting actual conditions of practice.

The department enjoys, to an unusual degree, those advantages which naturally accrue from the school's location. Being contigous to a world famous mining region, the nearness of large producing mines means much, while the wholesome mining atmosphere in which the student lives, furnishes a never failing supply of food for enthusiasm and interest.

The mining and metallurgical laboratory of the school, which has proven a most valuable adjunct to the work of instruction, has been completely overhauled and re-equipped with modern appliances of approved design. The operations attendant upon the preliminary treatment of various types of ore will here be carried out by students on a scale approaching commercial practice.

A summer school of mining is held each year immediately following the close of school in June. A suitable mining locality having been selected, students, under the direction of instructors, devote one week to the study of practical mining, both above and below ground, systematic note taking and careful sketching of all principal features being a requirement. Attendance upon this work is obligatory with all members of the Junior class.

The uniform courtesy and good will shown by the management of mining enterprises throughout the region, to instructors and students, indicates a wholesome regard for the efforts of the department and constitutes one of its most valued assets.

The following courses are offered by the department:

Mining 1-3.

Ore Dressing: The principles of ore crushing with description of the various types of crushing machinery; screens and the principles of screen sizing; stamp, milling and amalgamation; the theory and practical application of the dressing of ores by water currents, including description of the principal forms of classifyers; jigs and the laws of jigging; concentrating tables; slime treatment and the machinery for its accomplishment; magnetic concentration; concentration by oil; dry concentration; general discussion of the continental and English systems of ore dressing and their American modifications; the description and study of typical ore dressing plants.

Junior Year, First Semester: Four lecture periods and three laboratory hours per week.

Mining 2-4.

Mine Surveying: The location and patent survey of mineral claims; carrying on the meridian underground via vertical and inclined shafts; underground traversing and leveling underground connections. measurements of ore reserves and stope volumes; note taking and plotting.

Sophomore Year, Second Semester: Three lecture periods per week for eight weeks.

The field work of this course occupies one week of the summer school in June of the Sophomore year, and with the subsequent calculation and plotting of notes here obtained completes the course.

Mining 5.

Boring: The use of the earth auger, drive pipe, etc., in the boring of holes for wells and for prospecting purposes; the boring of deep holes by the churn drill and drop tool, also by the diamond and other rotary drills; the survey of bore holes; the cost of boring.

Breaking Ground: The excavation of earth and rock in general; hand tools; mechanical earth excavators; rock drills and their use; channelers; coal cutters; steam shovel; dredges, etc.; estimates and costs.

Explosives: Black powder, nitro-glycerine, gun cotton and their derivatives; methods of testing force of explosion and heat developed; pointing and charging of holes; methods of firing; costs of blasting operations.

Junior Year, First Semester: Three lecture periods per week.

Mining 6.

Tunneling: The driving of mine tunnels and drifts through rock and through soft or running ground; comparative costs; general discussion of the methods used in driving large tunnels for railroad and other purposes.

Transportation: Underground and surface haulage; vehicles and motive powers. self-acting and engine planes; tail rope and endless rope systems of haulage; electric and pneumatic haulage; surface tramways and aerial rope-ways.

Supporting Excavations: The use of wood, metal and masonry in the lining of shafts and other excavations, their relative cost, strength and durability; the timbering of stopes, stations and other working places underground; the preservation of timber.

Junior Year, Second Semester: Three lecture periods per week.

Mining 7

Drainage: Sources of mine water; dams and drainage levels; hoisting of water; Cornish and direct acting pumps; centrifugal pumps; use of compressed air and electricity in pumping operations; special examples and costs.

Compressed Air and Its Uses: The modern air compressor with accessories and the laws under which

it operates; conveyance of compressed air in pipes; effect of altitude. air compressed by the direct action of falling water; calculations; costs.

Hygienic Conditions: Surface arrangemeents for the comfort and convenience of men; ascent and descent by ladders, cage and man engine, and relative economy of different methods; accidents, their causes and prevention; rescue and relief of men; mine fires.

Senior Year, First Semester: Two lecture periods periods per week.

Mining 8

Administration: Business management and the principles of employment of labor; organization of mine staff.

Mine Examination: Sampling of ore bodies. estimation of "ore in sight" and the valuation of mining properties; forms of report.

Senior Year, Second Semester: Two lecture periods per week.

Mining 9

Shaft Sinking: The sinking of shafts for mining purposes through soil, rock, quicksand and other water bearing strata by approved methods; costs of same.

Exploiation: The extraction of mineral by open works, by wells and bore holes; the underground working of veins, bedded deposits and masses by methods best suited to each condition affecting the choice of methods; costs of ore extraction.

Senior Year, First Semester: Three lecture periods per week.

Mining 10

Hoisting: Hoisting engines, their construction and chief features; methods of equalizing the load moment on the engine; ropes, cages, skips and safety. appliances; gallows frames; pneumatic hoisting; costs.

Ventilation and Lighting: Natural and induced ventilation; furnaces and fans; friction of air in mines; control of air currents; efficiency of ventilating apparatus.

Open lights, safety lamps, the electric and other lights used in underground illumination.

Placer Mining: Sluices, riffles, pipe lines, nozzles and hydraulic elevators, their construction and use; river dredging; costs and results.

Senior Year, Second Semester: Three lecture periods per week.

Design of Mine Plant: The student is given certain data relative to a hypothetical mine, such as maximum depth of hoist, capacity of hoisting, etc., from which he calculates the power needed, selects the type and size of hoisting engine, makes calculations as to the size of reel for flat rope, and drums of different forms, such as to give the best results in the equalization of moment on the engine. He then calculates and designs the gallows frame and shaft house, also other features such as ore bin, mine cage, car or skip.

Senior Year: Six laboratory hours per week throughout the year.

Mining 13

Mine Accounting: Organization of corporations and stock companies, with particular reference to mining and metallurgical companies; discussion of systems of mine and mill accounting; keeping accounts with different departments; derivation of cost sheets, etc.; accounts of smelting and milling plants, yard books, furnace records, ore books, smelting records, etc. General methods of business; buying and selling ores; labor, etc.; organization of the staff of a mining and metallurgical company.

Senior Year, Second Semester: One lecture period per week.

Mining 14. MR. C. L. LEWIS.

Mining Law: During the year Judge C. L. Lewis will deliver a series of lectures before the members of the Senior class, in which he will discuss and exhaustively review the general mining laws with reference to the public lands, embracing, among others, the following topics: The early history of mining prior to the General Laws of Congress; the General Mining Laws of the United States and Territories; Mining Districts, their origin, how organized and the customs, rules and regulations of miners; lands subject to location and who can locate; the proper location of lode claims; the proper location of placer claims; patent proceedings; timber and stone lands in the mining states, and special laws applicable thereto.

Senior Year, First Semester: One lecture period per week for fifteen weeks.

Department of Engineering

PROFESSOR STEELE

The aim of this department is to give the student such training in the class room, drawing room and field as will properly fit him for his career as a mining engineer.

The department occupies two well lighted drawing rooms, 24x34 and 24x30 feet in size; lecture room and offices. The rooms are furnished with suitable drawing desks which have separate lockers for each student.

The work of this department extends over a period of three years and includes the following courses:

Engineering 1-2.

Mechanical Drawing: Practical work in the drawing room accompanied by lectures as needed. The the customs, rules and regulations of miners; lands struction. The course includes the care and use of

instruments; the mounting of sheets; sample geometric construction; orthographic projection, and both free hand and mechanical lettering of titles.

Students taking this course should provide themselves with the following list of supplies, most of which may be obtained from the supply room of the department at cost:

One set of drawing instruments containing:
One pair of 6-in. Compasses, with pen, pencil and needle points.
One pair 6-in. Dividers.
One 5 1-2 in. Ruling Pen.
One 3 1-2 in. Steel Spring Bow Divider.
One 3 1-2 in. Steel Spring Bow Pencil.
One 3 1-2 in. Steel Spring Bow Pen.
One T Square with 30 in. blade.
One 4 1-2 in. Protractor.
Two Irregular Curves, (Dietzgen, No. 10 and No. 19.)
One 7 in. 30 deg. by 60 deg. Triangle.
One 8 in. 45 deg. Triangle.
One 6H Drawing Pencil.
One Pencil Pointer.
One Pencil Eraser.
One Ink Eraser.
One Sponge Rubber.
One dozen Thumb Tacks.
One Pulp Board.
Eighteen sheets Whatman's H. P. 17x22 in. Drawing Paper.
One bottle Mucilage or Glue.
One bottle Black Drawing Ink.
One bottle Red Drawing Ink.

Drawing boards and key for locker are furnished by the School on the payment of a fee of $1 per year; 50 cents of this is refunded on return of key.

Freshman Year: Six laboratory hours per week throughout the year.

Engineering 3-4.

Descriptive Geometry: This work includes the projection of the point and the line and the representation of planes, with numerous problems relating thereto, and the generation, classification and intersection of curves and surfaces. Drafting room work with individual talks.

Sophomore Year: First semester, six laboratory hours per week; Second semester, three laboratory hours per week.

Text Book: Hall's Descriptive Geometry, with Plates.

Engineering 5-6.

Surveying: It is the desire of the department to bring, as far as it is practicable, theory and practice side by side. For this reason, the discussions in the class room are confined to such principles as can be given a practical application in the field or drawing room.

The institution is provided with all the instruments and accessories necessary to carry on the work. Additional instruments are purchased as the need for them arises.

For the performance of the field work, the class is divided into squads with just a sufficient number in each to properly carry on the work. Each student is required to take his turn at every part of the work; to use each instrument as the occasion demands; to make his notes and computations; and finally to accurately plot them in the drawing room.

The course outlined is as follows: Linear measurements by means of pacing and chain or tape; adjustment and use of the engineer's transit and level; traversing; principles of land surveying; adjustments and use of the plane-table; aljustment and use of the solar instrument; goedetic surveying including the measurement of a base line; measurement of the hori-

zontal angles; computations for the adjustment of the triangulation system; determination of the meridian by means of the solar instrument; determination of latitude; direct solar observation and observation on Polaris; measurements of volumes. Railroad surveying will receive as much time as the conditions will permit.

Sophomore Year: First semester, three lecture periods and three hours field work per week; second semester, three lecture periods per week for eight weeks and three hours field work per week for the whole semester.

A three weeks' summer school for practical work immediately follows the close of school in June, and completes the course in surveying. Two weeks are devoted to general surveying and one week to mining surveying under the Department of Mining.

Text Book: Johnson's The Theory and Practice of Surveying.

Engineering 7.

Topographic Drawing: This work consists in the accurate drawing of maps, including topographic features, and the plotting of profiles. Many of the notes taken in the preceding summer's field work are thus worked up in the drafting room.

Prerequisite Engineering 5-6.

Junior Year: Three laboratory hours per week for eight weeks.

Engineering 9.

Machine Designing: The drawing of screw threads, keys, fastenings, the various forms of gear teeth, bevel gears, bearings, cams, quick return motions, etc. It is designed to make this course eminently practical, an introduction to those problems which continually meet the designing engineer and which the principles of machine design alone will help him to solve. The application to mining machinery is never lost sight of

Drafting room work with talks as needed, and library references.

Junior Year: First Semester, six laboratory hours per week.

Engineering 11-12.

Graphical Statics: The object of this course is to give an understanding of the theory of the graphical solution of internal stresses in a framed structure, arising from steady and moving loads, from the pressure of the wind, etc. The student is required to determine by graphical methods on the drawing board, the nature and amount of internal stresses in the various members of such simple roof and bridge trusses and head frames as are assigned him.

Junior Year: One Lecture period and three laboratory hours for eight weeks of the first semester and all of the second semester.

Text Book: Hoskings, Elements of Graphical Statics.

Engineering 14.

Strength of Materials: The resistance and elasticity of the materials of engineering; fundamental assumptions of the common theory of beams; distribution of stresses in beams; shearing forces, bending moments, and deflections of beams; the common and exact theory of torsion, flexure, elastic limits; working stresses and ultimate stresses and ultimate resistance of cast-iron, wrought iron, steel, and timber; pipes and riveted joints; posts and columns; the design of posts, beams, shafts, etc.

Junior Year: Second semester, four lecture periods per week.

Text book: Merriman's Mechanics of Materials.

Engineering 15.

Professor Van Nuys.

Electrical Engineering: This course deals with the

principles and general construction of dynamo-electric machinery, systems of direct current distribution, direct current motors; their action, control and application, lighting equipments, the design, installation and operation of electric power plants, the principles and general construction of alternating and polyphase dynamo electric machinery, systems of alternating current distribution, and alternating current motors. In the laboratory, practice is acquired in the use of instruments, in the operation and testing of direct and alternating current dynamos, and motors, and trasformers, electrical measurements, and photometry of electric lamps.

Senior Year: First Semester, four lecture periods and three laboratory hours per week throughout the semester.

Text Book: Franklin & Esty, Elements of Electrical Engineering, 2 Vols.

Engineering 16.

Professor Van Nuys.

Hydraulics: The student takes up this course with a knowledge of hydrostatics from his work in Physics 5, and is thus prepared to commence with hydraulics proper, or the study of the laws governing the motion of water. He learns the methods of commercial measurement of water by both weir and orifices. The problems include the computation of diameters of pipes; pressures, and energy of confined water; dimensions of channels and ditches; velocity of flow, etc.

The School is favorably situated for field work in hydraulics. Rapid Creek is a mountain stream with a fall of about 1.6 per cent., offering splendid facilities for weir and velocity measurements; two large irrigation ditches are adjacent to the School, and Rapid City has three water-power plants within the city limits. The students thus have opportunity to visit and study hydraulic power plants in successful operation.

Senior Year: Second Semester, four lecture periods and three laboratory hours per week for eight weeks.

Text book: Mansfield Merriman's Treatise on Hydraulics.

Engineering 18.

Professor Van Nuys.

Thermo-Dynamics: This course begins with a discussion of the theory underlying the operation of heat engines. The theory of the operation of the ideal engine is developed, and the principles governing the actions of steam and gas engines, air compressors and refrigerating machines are fully discussed.

Senior Year: Second semester, four lecture periods and three laboratory hours per week for eight weeks.

Engineering 20.

Professor Steele.

Design of Power Plants: This course applies practically the principles developed in the preceding one. It embraces the history of the development of the steam engine, and a study of the types in successful use; the application of the indicator and Prony brake, and testing of boilers and fuels.

The School has three 40 horse-power boilers and a 40 horse-power Corliss engine; also a gasoline and a kerosene engine. This apparatus is available for laboratory work in this course.

Senior Year: Second semester, two lecture periods per week.

Department of Physics

Professor Van Nuys.

The courses in Physics are designed to give to the student a broad, general knowledge of the whole subject, as well as the knowledge most essential to his work as a mining or a metallurgical engineer.

Especial attention is given to the general laws underlying the science, and the history of the discovery and development of the important results is considered carefully. In the laboratory courses, the purpose is to excite in the student an interest in experimentation and to develop the ability for careful observation and the testing and sifting of results.

The courses offered by the department are as follows:

Physics 5.

Mechanics of Solids and Fluids, Sound and Light. In Mechanics especial attention is given to the empirical and practical aspects of the subject, while the more theoretical results are considered in Physics 9. Particular emphasis is laid upon the laws of motion, friction, work and energy, and hydro-mechanics. The complete treatment of the latter here serves as an introduction to the study of Hydraulics in the Senior year. The work of the semester ends with a careful study of the principles of light and a discussion of the various optical instruments.

Junior Year: First Semester, four lecture periods per week.

Text Book: Watson's Text Book of Physics.

Physics 6.

Heat, Magnetism and Electricity. In heat particular attention is given to the expansion of gases and vapors, specific heat, and to the energy relations of heat, giving the student a good foundation for Thermodynamics in the Senior year.

The subject of electricity receives careful and detailed consideration. The laws of electrostatics, resistance, electrolysis, potential, electromagnetism, and electromagnetic induction are studied in detail, and a comprehensive consideration of electrical measuring instruments, dynamos and motors, is entered into. The course closes with a development of the laws of

alternating currents and a study of alternating current machinery and transformers. This course is a necessary preparation for the course in Electical Engineering in the Senior year.

Junior Year: Second Semester, four lecture periods per week.

Text Book: Watson's Text Book of Physics.

Physics 7.

Laboratory course to accompany Physics 5. The aim of the laboratory work in this and the following course is not so much to perform a large number of experiments as to learn to work with care and accuracy. Determinations are made of the coefficient of friction, specific gravity of solids, liquids and gases, acceleration of gravity, velocity and rate of vibration of sound, analysis of sounds, velocity of light; and a comprehensive study of the various optical instruments with which the laboratory is well equipped, including the photometer, radiometer, spectrometer, spectroscope, polariscope, and projection lantern, is required. The laboratory is completely equipped with apparatus for the measurement of focal length of mirrors, lenses, etc., and for spectroscopic analysis.

Junior Year: First Semester, three laboratory hours per week.

Physics 8.

Laboratory course to accompany Physics 6. In Heat especial attention is given to the determination of calorific power of fuels, specific and latent heat, melting and boiling points, coefficient of expansion of solids, liquids and gases, and the determination of the energy equivalent of heat, and the plotting of cooling and freezing point curves. The laboratory is well equipped for an extensive course in electrical testing. The apparatus includes a complete set of Weston meters, including voltmeters, millivoltmeters, ammeters, millammeters, alternating current voltmeters, electrodynamometers, fluxmeters, magnetometers, potentio-

meters, permeameters, voltameters, Wheatstone bridges, many types of galvanometers, condensers, induction coils, static machine, X Ray tubes, wireless telegraph, etc. Dynamos, motors, electric lamps of various types, are at hand for the purpose of making tests of commercial efficiency. The school machine shop is at the disposal of students for the purpose of constructing apparatus for research work.

Junior Year: Second Semester, six laboratory hours per week.

Physics 9.

Analytic Mechanics: The theory is developed by lectures. The aim is to present the fundamental principles in as clear and simple manner as possible. Many problems will be solved to enforce the principles and to develop ability in the student to apply what he has learned to practical problems. Particular effort is made to cultivate the power of the student to use calculus methods when needed. The course includes the following subjects.

Statics: First principles; units, composition and resolution of concurring forces; composition and resolution of forces acting on a rigid body; conditions of equilibrium; center of gravity; friction; virtual velocities; machines; the funicular polygon and the catenary.

Kinematics: Rectilinear and curvilinear motion; composition and resolution of acceleration; angular velocity and angular acceleration; projectiles, etc.

Kinetics: Laws of motion; motion under the action of a variable force; motion in a resisting medium; constrained motion; the simple pendulum; centripetal and centrifugal forces. Impact; work and energy; moment of inertia.

Junior Year: First semester, three lecture periods per week.

Text book: Bowser's Analytic Mechanics; the works of Church, DuBois, Hoskins, Johnson, Lanza, Todhunter, and Routh, are used for reference.

Department of Chemistry

Professor Coolbaugh Mr. Wheelock

Mr. Anderson

The courses in chemistry are designed to give to mining and to metallurgical engineers the knowledge of chemistry most essential to their work. Especial emphasis is given to the laws underlying the science; the separations, estimations, etc., being made with these principles in mind. The purpose is to excite in the student an interest in experimentation, to cultivate methods of accuracy and rapidity in manipulation, and to teach the proper correlation of the results of experiments.

Chemistry 5-6.

General Chemistry: Lectures. This course is designed to give to the student a knowledge of the principal theories and laws of the science. The following subjects are discussed in an elementary way: Atoms and molecules, gases, liquids, solids, solutions, thermo and electro-chemistry, and chemical equilibrium. Special attention is given to those portions of the subject bearing upon osmotic pressure, freezing and boiling points of solutions, electrolytic dissociation and the law of mass action. A small amount of time is also given to the consideration of organic chemistry.

Freshman Year: Three lecture periods per week throughout the year.

Reference books: Newth's Inorganic Chemistry; Ostwald's Principles of Inorganic Chemistry; Jones' Elements of Physical Chemistry.

Chemistry 8.

General Chemistry Laboratory: Inorganic preparations, the study of crystallization and distillation, the use of indicators, and the effect of mass upon the time and extent of reactions.

Freshman Year: Three laboratory periods per week for the second half year.

Chemistry 9-10.

Qualitative Analysis: Lectures. The work in qualitative analysis begins with an outline of the general scheme of analysis. Then follows a minute study of the metals and the acid radicals with their detections and separations. Emphasis is placed on the principles of oxidation and reduction, and the theories of ionization and hydrolysis. Separations are made before the class in order to give an idea of the correct use of reagents and of the methods for rapid manipulation.

Freshman Year: First semester, two lecture periods per week; second semester, one lecture per week.

Reference books: Prescott & Johnson's Qualitative Analysis; Treadwell's Qualitative Analysis.

Chemistry 11-12.

Qualitative Analysis, Laboratory: This covers the separation of metals and acids in solutions, dry mixtures, minerals, slags, and alloys.

Freshman Year: First Semester, nine laboratory hours per week. second semester, six laboratory hours per week.

Chemistry 13-14.

Industrial Chemistry, Lectures: The subjects considered in this course are acids, alkalis, sulphur, chlorine, bromine, idodine, cyanides, fertilizers, explosives, bricks, clays, cements, mineral paints, fuel and refractory materials.

Sophomore Year: Two lecture periods per week throughout the year.

Reference Book: Thorp's Outlines of Industrial Chemistry.

Chemistry 15-16.

Quantitative Analysis: Lectures. The work in quantitative analysis consists of: Discussions of the relatives merits of methods applied in the laboratory, the study of articles and reviews from chemical peri-

odicals, and the subject of chemical calculations.

Sophomore Year: Two lecture periods per week throughout the year.

Reference Books: Miller's Notes on Quantitative Analysis; Miller's Calculations on Analytical Chemistry; Treadwell's Quantitative Analysis; Sutton's Volumetric Anaylsis; Low's Technical Methods of Ore Analysis.

Chemistry 17-18.

Quantitative Analysis, Laboratory: The course covers the subject of mineral analysis, including both gravimetric and molumetric methods. The analysis required are: Magnesium sulphate, sodium or other chloride, potassium alum, coal, iron ammonium alum, iron ore, pig iron, spiegel or manganese ore, zinc ore, copper ore or matte, brass, lead ore, chromic iron, limestone, arsenic ore, antimony ore, slag, and gas analysis.

Sophomore Year: Nine laboratory hours per week throughout the year.

Chemistry 19-20.

Metallurgical Chemistry: Lectures. This course is to familiarize the student with the analytical methods used in conjunction with metallurgical processes. The subjects studied are: The technical methods connected with the metallurgy of iron, steel, zinc, lead and copper; the determinations of bismuth, mercury, cadmium, tin, nickel, and the rare elements of commercial importance, and the analysis of electrolytic slimes.

Brerequisites: Chemistry 2, 3 and 4 or equivalents.

Junior Year: First Semester, three lecture periods per week; second semester, one lecture period per week. Required of Juniors taking the metallurgical option.

Chemistry 21-22.

Quantitative Analysis, Laboratory: Work corresponding to Chemistry 19-20.

Junior Year: First semester, six hours per week; second semester, two hours per week.

Department of Mathematics

PROFESSOR MCLAURY.

The engineer, from the very nature of his work, must of necessity meet many difficult problems. His success will depend on his ability to solve them. As it is impossible to tell in advance just what experience a given student will meet, that course is best which results in mental power. It is not a question of what the student has done,but what he can do. Has he a comprehensive grasp of the subject; has he thoroughly mastered the principles; can he apply these principles to kindred subjects?

The aim of this department will be to give the student a thorough knowledge of the principles of mathematics so as to enable him to apply them readily to the solution of practical problems. Original work is encouraged, and an effort is made to cultivate the habit of exact logical reasoning, and to stimulate independent thought. Both rapidity and accuracy are expected in all mathematical work. The great importance of mathematics as the basis of a scientific education justifies the requirements of all elementary courses, as a prerequisite to the Mining Engineering Course.

No course in Algebra is offered in the Engineering Department. However, in the following courses, particular pains will be taken to explain all the more difficult algebraic processes as they occur. Several subjects in higher algebra will be discussed, each at the point where it is required for immediate application. Students who have not studied algebra for a year or more, should make a careful review before

entering school, for a thorough knowledge of the elements of algebra is essential to the successful completion of all subsequent courses.

Mathematics 7

Trigonometry: Plane, analytical, and spherical. Considerable attention is paid to the consistent and scientific development of the fundamental conventions and definitions, and to the derivation and transformation of trignometric expressions. Many practical problems are solved.

Freshman Year: First semester, five lecture periods per week for sixteen weeks.

Text Book: Phillips & Strong's Trigonometery.

Mathematics 8.

Analytic Geometry: This course includes the following subjects: Loci; straight lines; transformation of co-ordinates; circles; conic sections; the general equation of the second degree and higher plane curves. The theory will be developed by lectures.

Freshman Year: Second semester, five lecture periods per week for eighteen weeks.

Text Book: Nichol's Analytic Geometry, with Smith & Gale, Puckle, Ashton, and C. Smith for reference.

Mathematics 9.

Differential Calculus: The text book work is supplemented by lectures. This course will include the discussion of a few subjects in higher algebra and will be preceded by a short course in solid analytic geometry, based on Nichol's Analytic Geometry.

Sophomore Year: First semester, five lecture periods per week.

Text Book: Granville, Differential and Integral Calculus.

Snyder & Hutchinson, Murray, and Williamson are used for reference.

Mathematics 10

Differential and Integral Calculus: This course is a continuation of the last course and will include the most of the work in Granville's Calculus.

Sophomore Year: Second semester, five lecture periods per week.

Department of English

PROFESSOR MCLEARIE.

The aim of this department is to give the student a command of good idiomatic English and to aid him in the development of the art of expression. Especial emphasis is laid upon the omportance of good composition in technical work. Attention is called to the absolute necessity that every professional man should be able to express his thoughts with clearness and accuracy.

English 9

The elements of effective writing. This course gives both theoretical and practical instruction. The theory is taught by class room work based on standard text books. The practice is obtained by exercises, written in the class room, and by weekly themes. At least one theme a week is required, and every theme is returned to the student to be revised or rewritten.

Freshman Year: First semester, four lecture periods per week.

Text Books: Wendell's English Composition; Pearson's Principles of Expression; Baldwin's College Manual of Rhetoric.

English 10

This course supplements the work of the first semester by giving further practice in narrative, expository and argumentative writing. A study is made of the works of such authors as will aid in practical composition work. Three themes are required, each

containing from 800 to 1,000 words. There will be a conference on each theme.

Freshman Year: Second semester, four lecture periods per week.

English 12

Economics: This course will give a brief survey of the principles of economics. It will also include discussions of the more important contemporary economic and social problems.

Junior Year: Second semester, three lecture periods per week.

List of Students in Mining and Meturgical Engineering

SENIOR CLASS

Bennett, Richard T.....Pierre S. D.
Eddy, John Wasson.....Helena, Mont.
Elliott, John Wing.....Columbus, Nebr.
Flower, George Earl.....Akron, Ohio.
Jeffries, Zay.....Ft. Pierre, S. D.
Sargent, Arthur E.....Rapid City, S. D.
Stoner, John William.....Lincoln, Nebr.
Saville, Joseph H.....Rapid City, S. D.
Wheelock, Harry Ellis.....Rapid City, S. D.

JUNIOR CLASS

Anderson, William L.....Twin Falls, Idaho.
Ballard, Peter A.....Rapid City, S. D.
Brooks, Floyd.....Rapid City, S. D.
Ehle, Chester G.....Rapid City, S. D.
Muhmel, Fred J.....Scotland, S. D.
Quinney, Elwin H.....Alexandria, S. D.
Winsor, Frank H.....Mitchell, S. D.
Willard, Clarence G.....Rapid City, S. D.

SOPHOMORE CLASS

Adams, C. Walter.....Mitchell, S. D.

Conway, Clifford L.....Hampton, Iowa.
Dickey, Sam C.....Spearfish, S. D.
DeGroot, George R.....Salt Lake City, Utah.
Fahrenwald, Frank A.....Rapid City, S. D.
Mosier, Peter.....Rapid City, S. D.

FRESHMAN CLASS

Alder, Alfred.....Volin, S. D.
Anderson, Amil.....Rapid City, S. D.
Atkins, Walter C.....Columbia, S. D.
Barker, Edward H.....Ft. Pierre, S. D.
Foy, Edgar C.....Rapid City, S. D.
Henton, Hugh M.....Spearfish, S. D.
Pryer, W. Cristy.....Aberdeen, S. D.
Schott, Alfred M.....Sioux City, Iowa.
Stanley, Ward A.....Hot Springs, S. D.
Schad, Hans.....Ludwigshafen, Germany
Tolson, William H.....Baltimore, Md.
Wheelock, Clarence E.....Rapid City, S. D.

Special Mining Students

Bentley, Charles.....Deadwood, S. D.
Lewis, Earl L.....Rapid City, S. D.
Newport, Glenn H.....Bisbee, Ariz.
Cook, E. W.....Rapid City, S. D.

List of Students Preparing for Mining Courses

Coursen, Ruth.....Rapid City, S. D.
Bochert, W. C.....St. Augustn, Fla.
Boland, William.....Keystone, S. D.
Borst, Olney H.....Pierre, S. D.
Brooks, Warren.....Rapid City, S. D.
Bower, Laura G.....Rapid City, S. D.
Cox, Floyd.....Rapid Cty, S. D.
Anderson, Leon.....Rapid City, S. D.
Edgerton, Leroy D.....Spearfish, S. D.
Fahrenwald, Arthur W.....Rapid City, S. D.
Freese, Arthur.....Sioux Falls, S. D.

Gira, Bernard.....Custer, S. D.
Gale, Lysle.....Rapid City, S. D.
Griffin, Edward L.....Buffalo Gap, S. D.
Holly, George H.....Rapid City, S. D.
Hill, Robert S.....Rapid City, S. D.
Leary, Cornelius.....Rapid City, S. D.
Lenhart, Warren.....Rapid City, S. D.
Lanphere, Clarence.....Rapid City, S. D.
Murphy, John A.....Ft. Pierre, S. D.
Platt, Edward.....Rapid City, S. D.
Pilcher, Warren T.....Custer, S. D.
Peck, George C.....Henry, S. D.
Parker, Archie.....Rapid City, S. D.
Taylor, S. F.....Rock Island, Ill.
Zink, Benjamin.....Rockerville, S. D.

Alumni of the South Dokota School of Mines

Eighteen Hundred Eighty-eight.

John W. Hancher, B. S., M. A. With National Packing Co., Mexico City, Mex.

Eighteen Hundred Ninety.

Carrie Feigel, B. S., Rapid City, S. D.

Benjamin Poznansky, B. S., Western Representative, Gerhard-Mennen Chemical Co., Newark, N. J.

Eva Robinson, B. S., M. A. Supervisor of the Domestic Science Department, Unversity of Chicago, Chicago, Ill.

Eighteen Hundred Ninety-one.

G. Howell Clevenger, B. S., E. M., South Dakota School of Mines; M. A., Columbia University. Associate Professor of Metallurgy, Stanford University, Calif.

Max Hopkins, B. S. With International Correspondence School of Scranton, Pa. Address, 1651 Jefferson Ave., St. Louis, Mo.

Nineteen Hundred Two.

Areli C. Overpeck, B. S., E. M. Superintendent, Dakota-Calumet Mining Co., Hill City, S. D.

C. C. Thompson, B. S., E. M. United States Deputy Mineral Surveyor for Nevada, Goldfield, Nev.

Nineteen Hundred Four.

U. S. S. Arentz, B. S., E. M. Superintendent Nevada Douglas Copper Co., Yerrington, Nev.

Arthur E. Hall, B. S., Met. E. Assistant Superintendent, Copper Department, American Smelting & Refining Co., Omaha, Nebr.

Elmer W. West, B. S., M. E. Engineer, Nevada-Omaha Mining & Milling Co., Bannock, Nev.

Guy E. Wolcott, B. S. Mining Engineer, Golita, Cali.

Nineteen Hundred Five.

O. Allen Anderson, B. S. E. M. Mining & Metallurgical Engineer, Salmon City, Idaho.

James Halley, Jr., B. S., Cashier Keystone Bank, Keystone, S. D.

Hollis W. Overpeck, B. S., E. M. Engineer, Oliver Iron Mining Co., Mountain Iron, Minn.

Nineteen Hundred Six.

Louis L. Penhoel, B. S. Superintendent, Dexter Mining & Development Co., Atlantic City, Wyo.

Peter Whytock, B. S. Consulting Engineer, Key Gold Mining Co., 60 State St., Boston, Mass.

William Gaines, B. S. Engineer, Leesburg Mining Co., Leesburg, Idaho.

B. D. O'Brien, E. E., Rose Polytechnic, 1896; B. S., E. M., South Dakota School of Mines. Superintendent, Leesburg Mining Co., Leesburg, Idah.

Frederick Wetherald, B. S. Boston, Mass.

Earl Van L. Smith, B. S., Assayer, New York, Honduras Rosaria Min. Co., San Juancito, Hond.

Edwin Coolidge, B. S., E. M. Mill Chemist, Kendall Gold Mining Co., Kendall, Mont.

Herbert Seiter, B. S. Mining Engineer, Ekalaka, Mont.

Harry T. Curran, B. S., E. M. Manager, Los Ailes Mining Co., Ayutla, Mex.

J. Burns Read, B. S., E. M. Mining & Metallurgical Engineer, Salmon City, Idaho.

NINETEEN HUNDRED SEVEN.

Frank Bryant, B. S. Mine Foreman, Leesburg Mining Co., Leesburg, Ida.

Frank Anderson, B. S. Engineer, Boise, Idaho.

Wharton Cornell, B. S. 1711 Rodney St., Wilmington, Del.

Otto Ellerman, B. S. Engineer, Atlantic City, Wyo.

Bernard Matson, B. S. Imlay, S. D.

Lloyd Mellinger, B. S. Assayer and Chemist, Mountain Copper Co., Martinez, Cali.

Milton Morris, B. S. Rapid Cty, S. D.

C. C. Van Nuys, A. B., Yankton College; B. S., E. M., South Dakota School of Mines; A. M., Columbia University. Professor of Physics, South Dakota School of Mines, Rapid City, S. D.

Charles Whitmore, B. S. Cashier Lincoln County Bank, Canton, S. D.

Leon Peck Wells, B. S. Engineer, Calumet & Arizona Mining Co., Box 1433, Bisbee, Ariz.

NINETEEN HUNDRED EIGHT.

Cyril Cooledge, B. S. Engineer, Arena Gold Mining Co., Georgetown, British Guiana.

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Lem S. Overpeck, B. S. With Dakota-Calumet Mining Co., Hill City, S. D.

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Fred W. Winters, B. S. With Golden Age Mining Co., Pioneerville, Idaho.

W. G. Sparling, B. S. Rapid City, S. D.

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Ivan E. Goodner, B. S. With C. E. Bogardus & Co., 90 Columbia St., Seattle, Wash.

Nineteen Hundred Nine.

Jesse O. Betterton, B. S. Columbus, Nebr.

Roy F. Coolidge, B. S. Assayer, Homestake Mining Co., Lead, S. D.

Eli A. Hvistendahl, A. B., University of South Dakota; B. S., South Dakota School of Mines. Vermillion, S. D.

H. W. Jones, A. B., University of South Dakota; B. S., South Dakota School of Mines. Rapid City, S. D.

Lewis W. Ledyard, B. S. Draftsman, Homestake Mining Co., Lead, S. D.

Willard C. Marshall, B. S. Assistant Superintendent, Arema Gold Mining Co., Georgetown, British Guiana.

Herbert N. Read, B. S. Assayer and Chemist, Socorro Mining Co., Mogollon, N. Mex.

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